HONI SOIT QUI MAL Y PENSE

CHARLES EARL OF LIVERPOOL,

L. L. D.

Late a Vice President of the Society
for the Encouragement of
Arts, Manufactures and Commerce

Engraved by Wm Evans from an Original Drawing by H. Edridge
in the Possession of the present Earl of Liverpool.

16766

TRANSACTIONS

OF THE

SOCIETY,

INSTITUTED AT LONDON,

FOR THE

ENCOURAGEMENT

OF

ARTS, MANUFACTURES, AND COMMERCE;

WITH THE

PREMIUMS offered in the Year 1809.

VOL. XXVII.

LONDON:

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Sold by the HOUSEKEEPER, at the SOCIETY'S HOUSE, in the ADELPHI; and by Messrs. ROBSON, J. WHITE, BECKET, JOHNSON, CADELL and DAVIES, PHILLIPS, WALTER, RICHARDSON, LONGMAN and REES, TAYLOR, and WYATT.

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PREFACE.

THE Portrait of the late CHARLES Earl of LIVERPOOL, LL.D. from a drawing in the possession of the present Noble Earl his son, forms the Frontispiece to the 27th Volume of the Transactions of the Society, instituted at London for the Encouragement of Arts, Manufactures, and Commerce. The very great attention which his Lordship ever paid to the interests of the trade and commerce of this country, give him a peculiar claim to the respect of the Society, of which he was elected a Member in the year 1789, and one of their Vice-Presidents in 1791. His Lordship honoured the Society by an annual subscription of Five Guineas, and by a marked attention to their Communications on various points of commercial business. He died on the 17th of December, 1808, aged 81 years, having for a long period enjoyed the confidence of his present Majesty.

The Society have, with unremitting attention, during the last session, exerted themselves for the benefit of the public, and they trust that the present Volume will be found to contain a great variety of matter deserving public approbation. The Society are not ambitious of assuming the title of a literary or a scientific body, there being other Societies ex-

pressly instituted for such purposes, but they are anxious to be considered as the promoters and patrons of those useful Arts by which every class of mankind is benefited.

The present Volume commences, as usual, with Communications in the Class of Agriculture.

The great importance of Plantations throughout the waste lands of the united empire is now become so obvious as to require no arguments to enforce it. The effort of John Christian Curwen, Esq. of Workington, in this line, probably exceeds any attempt of a similar kind ever made by any one person in any country within the same period, he having planted within one year one million two hundred and sixty-nine thousand forest-trees. This exertion cannot fail strongly to impress upon the mind the benefits he has thus rendered to his country.

Much praise is due to Dr. William Thackeray, of Chester, for improving the estate of his stepson, a minor, by extensive plantations of ash, beech, chesnut, elm, and other trees; he has set an example well worthy of imitation by those gentlemen who are left the guardians and trustees of youth. And if any doubts should exist upon the real advantage of plantations on barren lands, a view of the forest-trees planted by Dr. Bain, at Heffleton, recorded in our last volume, would carry conviction to the mind.

William

William Congreve, Esq. of Aldermaston House, in Berkshire, hath sown and planted seventy-four acres of land with acorns and oaks. The growth of this valuable timber is an object of the first importance to the British Navy, that bulwark of our country and terror of our enemies.

No vegetable root is so useful a food for man or beast as the Potatoe; but it is a lamentable fact, that either through fraud or indolence, or probably owing to both, this valuable product is greatly injured by the London practice of soaking them long in water under pretence of cleaning, by which a considerable increase in weight is made, by absorption of a quantity of the water, which is a gain to the seller, but renders them sodden and difficult of digestion. The Machine invented for washing them by Mr. William Lester, of Paddington, obviates all these inconveniencies, does the business with ease and dispatch, and leaves them ready for use in a clean and wholesome state.

It is well known that the natural products of Great Britain were formerly very few in comparison with those which have been subsequently introduced here from foreign countries. The difficulty of preserving trees and plants in a vegetating state, during long voyages, hath been a great impediment to improvements, or the general dissemination of vegetable products; but this is now in a great measure removed by a discovery made by Mr. William Salisbury, of

Brompton Botanic Garden, which consists in packing small plants or cuttings with alternate layers of that species of long moss, called the Sphagnum Palustre of Linnæus, which possesses a peculiar property of resisting putrefaction in both animal and vegetable substances.

Comparisons of the different modes by which useful animals are fed in various parts of the united empire, naturally lead to ascertain what articles can be cultivated by the farmer for such purposes with the greatest profit. The communication of the mode of cultivation of Parsnips, in the island of Jersey, by Charles Le Hardy, Esq. shows that they are considered there as an essential part of their crop; and that this saccharine root is particularly useful for fattening cows and hogs. It possesses many advantages which recommend its cultivation to the English farmer, particularly from its very nutritious quality and resistance of frost.

The Rev. James Hall, of Walthamstow, anxious to furnish a substitute for Hemp for naval purposes, and at the same time to provide employment for the poor, has proved, by a series of experiments, that fibres of very great strength, and applicable to the purposes of hemp, may be procured in large quantities from bean-stalks, collected and prepared after the beans are separated from the pods, and that the refuse part of the stalks, after the fibres are removed, form a nutritious food for cattle.

When

When it is considered that any given quantity of tolerable land may be rendered valuable, or not, according to the nature of its product, attention becomes necessary to encourage that kind of Grass which yields the greatest crop and best nutriment for cattle; Mr. William Salisbury's communication on Grasses throws considerable light upon this subject.

Mr. John Saddington, of Finchley, has made some judicious experiments on the comparative merits of drum-headed Cabbage, Swedish Turnips, and Kohl Rabi, as food for cattle during the winter months; his opinion is in favour of the kohl rabi; and if we can form any certain judgment from the very great repute in which this vegetable is held in Germany, we are led to conclude, that sufficient attention has not been paid to its more extended cultivation in Great Britain.

The communication from Major Spencer Cochrane, of Muir House, on the benefit of Furze and its blossoms, conveys this useful lesson, that persons should be more minute than they usually are, in enquiries respecting the qualities of common plants, and it confirms the experiments heretofore made, that furze, properly prepared, will, in time of scarcity, and on several other occasions, form a useful food for cattle.

The information furnished by Mr. C. Waistell, of High Holborn, in our 26th Volume, on the value of growing

Timber Trees at different and distant periods, has created so general an interest with the public, as to occasion its being reprinted in several periodical publications, and to continue in great demand. Mr. Waistell has, in the present volume, favoured the Society with some additional remarks upon the subject, and recommended measures, which, if adopted, would be of great national benefit.

Under the Class of Chemistry, it will be found that the efforts of the Society to bring forward to the public the different species of Marble, which the quarries of the united empire can furnish, has been successful; the beautiful varieties of marble which decorate the Great Room of the Society, produced by Mr. J. P. Hubbard, of Pickett-street, from the Babicomb quarry, in Devonshire, have attracted the public attention, and his example has been followed with specimens from Scotland and Ireland.

A new æra has lately taken place in Chemistry, and many interesting discoveries made in this science. Mr. H. Porret, Jun. has this session contributed his endeavours towards such improvements, and has made some curious experiments and observations on the constituent principles of the Prussic and Prussous Acids.

The Madder Roots of the Levant are universally acknowledged to yield brighter colours for dyeing Cotton

Yarn

Yarn than the Madder procured from Holland. In order to ascertain whence the difference arose, John Spencer Smith, Esq. brother to Sir Sidney Smith, was requested to procure some Madder Seed from Turkey. He favoured the Society with some specimens thereof, and from these Mr. William Salisbury hath raised in Sloane-street a considerable number of plants, which appear to be more brilliant in colour, and to yield a larger quantity of Dye than that species of Rubia Tinctorum, which hath been cultivated usually in England, and supposed to be the same as the Dutch Madder.

Particulars of the Rewards bestowed under the Class of Polite Arts, will be found in page 20 of the present volume, and the performances, in general, did great credit to the young persons rewarded. A valuable Map of Shropshire, by Mr. Baugh, introduced to the public under the auspices and reward of the Society, has been strongly recommended by the nobility and gentry of that county, many of whose signatures to certificates appear in the volume.

An idea having for some time prevailed that the Silk-weavers of this country could not produce from their looms manufactures equal to the French, that public spirit which pervades the minds of every class of commercial men, and has contributed so largely to the prosperity of this country,

excited

excited the Spitalfields Weavers to undertake a work, hitherto unrivalled in the manufacturing world; some particulars of it are given in the present volume, and a reference may be had to the work itself now in the loom. A committee, deputed from these associated weavers, solicited and received the patronage of the Society.

A very ingenious Machine, for covering Wire with Silk or Thread, has been lately invented by Mr. William Saddington, which possesses the advantages of doing the business better, cheaper, and in a much smaller space of room.

Under the Class of Machines, it will be found that many useful inventions have been rewarded in the last session of the Society. The great pains which have been taken by John Miller, Esq. of Bedford, to rescue persons from drowning, and to recover such bodies as have sunk under water, do infinite credit to the head and heart of that worthy Magistrate; and his inventions appear to be more effectual for the purposes intended, than any hitherto laid before the public.

Mr. Thomas Newton, of Bridge-street, has invented an ingenious method of cutting Roots for Cattle, and articles for culinary purposes, which performs the business with ease and expedition.

Naval

Naval improvements have, for several years past, formed a considerable part of the Society's Transactions, and will doubtless ever be thought highly deserving of the Society's consideration. Captain Bolton's Jury-masts for ships were mentioned in our last volume, and the Society have since received from him, not only particular accounts of the manner in which such Jury-masts should be rigged, but also some observations deserving attention, respecting a new and cheaper mode of rigging Ships in general, and securing the Shrouds.

The difficulty of procuring wooden Knees of natural forms, for securing the beams of ships, hath called forth the exertions of many excellent mechanics. Amidst several substitutes proposed to answer this purpose, the invention of Mr. George Williams, of the Dock-Yard, Chatham, hath been thought by the Society to hold a distinguished rank.

On considering the immense number of Carriages employed for the conveyance of persons or passengers in every part of the kingdom, and the numerous accidents frequently arising from the Linch-pins of carriages breaking or flying out, the safe and simple contrivance by which Mr. J. Varty, of Liverpool, hath obviated this evil, will probably meet with universal approbation. His Linch-pin can be adapted to carriages of every construction, and a mere inspection of

the

the engraving will decidedly prove its utility, and recommend it for general use.

It may be remarked as a singular circumstance, that the rapid improvements which have carried our Cotton Manufactories to such a degree of excellence, as amongst the dangers of war to force a market in every part of the world, have taken place since the establishment of this Society. The first idea of spinning more threads than one at the same time, originated from and was rewarded by it. The same observation applies to the ingenious art of weaving Marseilles quilting, to the beautiful needle-work of Miss Linwood, and to an infinite variety of other cases. The machine for hackling Hemp and Flax, the invention of Mr. Matthew Murray, of Leeds, noticed in the present volume, bids fair to be the ground work of great improvements in the linen manufactories, as it can perform the work in a superior manner, and at a cheaper rate than by the hand.

The advantages of speedy communication, on many occasions, are too well known to require any comment. The Anthropo Telegraph, invented by Mr. Knight Spencer, gives very great facility for such communications either by day or night, and the whole apparatus may be made at very little expense.

The

The simple and ingenious contrivance of that gallant officer, Lieut. Spratt, R. N. by which the whole combination of figures can be carried to any extent, merely by different positions of a handkerchief, appears to have simplified communication by signals beyond any thing that could have been expected. The Homographic Signals are learned in a few seconds, and every thing essential for it may be contained in a common coat-pocket.

There are few persons who have not found the necessity of preserving and of referring to many receipts and other papers, and experienced the great trouble of taking off and replacing such papers occasionally when filed. Mr. White, of Essex-street, has invented a Letter-file upon such a principle, that the whole process above-mentioned may be speedily and easily effected, and every paper preserved in its proper place.

Mr. Thomas Warren's Engraved Slates, furnish facilities for learning to write in a very complete and easy manner; their use will considerably abridge the expenses of this branch of education, and the letters and figures to be copied are formed in a superior style to the hand-writing of many masters.

Slate-pencils have usually been imported from Holland, and

and considerable sums of money remitted from England for their purchase; Mr. J. Brockbank's ingenious Machines for making this article in a superior mode to the foreign, will probably so far reduce their price, as to insure them a demand even upon the Continent.

Every person, particularly if resident in the country, must have experienced the vexation arising from petty depredations upon his property, and many unpleasant suspicions have arisen respecting the offender, without knowing who he really is. Mr. Robert Salmon, of Woburn, has invented an ingenious instrument for detaining and exposing the depredator, without doing him any serious bodily injury; it is effectual, and easily placed without being suspected.

The present mode of building Cottages is so expensive, and the difficulty of procuring the usual materials for the purpose so great, that the poorer classes frequently suffer greatly from the inclemencies of the weather, in the wretched hovels which they inhabit. In many parts of the Continent, very comfortable habitations have been made of beaten earth, called Pisè Buildings, and attempts for constructing such in England have, at different times, been unsuccessfully made. Mr. Robert Salmon, of Woburn, with that nice discrimination and skilful execution which characterize all his undertakings, has not only completed several buildings upon

upon this plan, but improved considerably the machinery necessary for such buildings, and given a full detail of the means of doing the business effectually, so as to possess many advantages over stone or brick buildings.

From the alarming accidents resulting from the fires which frequently occur amongst tallow-chandlers, and other manufacturers of inflammable matters, the Society have thought it expedient to publish an account of an ingenious model of a Boiler, with a double rim and channel, by which inflammable matters may, on boiling over, be conducted without danger to a vessel appointed to receive them. The model was presented to them by Mr. Bream, of Yarmouth, and they have no doubt but that much mischief might be prevented by the use of boilers on such a construction.

The clock and watch-making business is very extensive, and great improvements have arisen in mechanics from persons originally in this employ; emulation in this line is constantly producing something new, and the simple and ingenious Clock Escapement of Mr. George Prior, Jun. will be found to have considerable merit.

There is scarcely any person who, at one period of life or another, hath not suffered acute pain from some extraneous matter, as a fly, dust, &c. getting into the eye, and found some difficulty in obtaining relief; the Eye Bath, invented by

Mr.

Mr. J. Ducket Ross, removes such impediments with ease, and weak eyes are much strengthened by its use.

From Mr. Gilbert Gilpin's communication, we learn that the superior advantages arising from the use of Iron Chains upon his plan over hempen ropes, both in action, safety, and price, are daily confirmed by experience.

The miseries endured by those unhappy beings, the Climbing-boys, or infant Chimney-sweepers, hath not only interested the humanity of the inhabitants of this great metropolis, but called forth the attention of many other persons throughout the kingdom. Much praise is due to the Committee established at Sheffield, for the pains they have taken to remedy this evil, and their communication upon the subject not only deserves the attention of individuals, but points out to the Legislature some effectual means for abolishing a practice long the peculiar disgrace of this island.

Under the Class of Colonies and Trade much interesting information is opened to the public.

The encouragement of the culture of Hemp in Canada is still attended to with a vigilant eye by the Society; and the information given by Mr. Charles F. Grece points out how some difficulties which have intervened, respecting the procuring of good seed, may be prevented in future. The

Society

Society lamented that, owing to some irregularity in the claim, they could not, consistent with their rules and orders, give him their Gold Medal; but they conferred upon him their Silver Medal, set in a broad Gold Border, as an honor nearly equal.

The indefatigable attentions of Dr. Alexander Anderson, of St. Vincent, procure to the Royal Botanic Garden, there established, some valuable product every year, diffusing benefits not only to that quarter of the world, but pointing out various articles to Great Britain, likely to be serviceable to her Commerce and Manufactures. The Society have heard with great pleasure, that Government have engaged to make some provision for this worthy and active subject, in case age or infirmity should prevent the continuance of his wonted labours.

The natural products of the East Indies afford an unbounded prospect for unremitting investigation; Mr. J. Maclachlan has furnished from thence some useful hints in Manufactures and Medicine; but the indefatigable exertions of Dr. William Roxburgh, of Calcutta, to extend human knowledge upon almost every subject connected with the views of this Society, demand universal applause. His observations on the articles he hath lately sent to the Society, the instructions he has given in preserving plants, seeds,

and roots, during long voyages, and the interesting communications he hath procured from Dr. B. Heyne, respecting the Soda or Marine Alkali, of which our colonies in India could furnish the whole demand of the united empire, together with the curious account of the Diamond mines of Malavilly, will furnish a large field of investigation to the amateurs of Mineralogy, Chemistry, and Natural History.

We trust that the public will be much gratified with the great variety of articles which the present volume contains, and the numerous explanatory Engravings executed by that eminent artist, Mr. Porter, in a manner which does him much credit.

The present session of the Society commenced the first Wednesday in November, and a variety of new inventions and improvements have been already submitted to their consideration; the Society are ever ready to pay attention to every object connected with the nature of their Institution.

The Society express their thanks to the several public bodies and individuals, from whom they have received sundry presents, noted in page 265 of the present volume; and are particularly obliged to Alexander Mitchell, Esq. for many valuable additions to their library, and other spirited exertions to promote their interest.

The Society desire it to be clearly understood, that, as a body, they are not responsible for any opinion or representation of facts contained in the following pages. They have endeavoured only to compress, into a form more concise, such communications as appeared to them too diffuse when received.

The accession of new Members to the Society is annually very considerable; their Weekly Meetings and Committees are well attended; and their Finances are in a very flourishing state.

The great advantages to be enjoyed by the Members for acquiring and diffusing useful knowledge, originally united their predecessors in one common bond of interest for the public good; and there is no doubt but that great benefit will continue to accrue to the united empire by the exertions of their successors.

Adelphi, London,
Dec. 30, 1809.

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PREMIUMS offered in 1809, *by the* SOCIETY *instituted at* London, *A. D.* 1754, *for the Encouragement of Arts, Manufactures, and Commerce, with a List of the present Officers.*

PRESIDENT.

Charles, Duke of Norfolk, F. R. and A. S.

VICE-PRESIDENTS.

John, Duke of Bedford.
Wm. Henry, Duke of Portland, F. R. and A. S.
Hugh, Duke of Northumberland, F. R. and A. S.
George, Earl of Dartmouth, K. G. and F. R. S.
Jacob, Earl of Radnor, F. R. and A. S.
Charles, Earl of Romney, F. R. S.
Hon. Robert Clifford, F. R. and A. S.
Sir William Dolben, Bart. L. L. D.
Sir Robert Peel, Bart. M. P.
Sir Watkin Lewes, Knt.
Thomas Pitt, Esq. F. A. S.
Caleb Whitefoord, Esq. F. R. and A. S.
Richard Clark, Esq. Chamberlain.
Nathaniel Conant, Esq.
Richard Powell, M. D.
John Christian Curwen, Esq. M. P.

CHAIRMEN OF COMMITTEES.

Accounts.
William Lumley, Esq.
Abraham Osorio, Esq.

Correspondence and Papers.
William Tooke, Esq.
Edward Bancroft, M. D.

Polite Arts.
J. T. Barber, Esq.
John Chambers, Esq.

Agriculture.
Matthias Deane, Esq.
T. H. Andrew, Esq.

Manufactures.
J. Pearsall, Esq.
J. Trelawny, Esq.

Mechanics.
J. Kenworthey Cooke, Esq.
Thomas Gill, Esq.

Chemistry.
Henry Coxwell, Esq.
G. D. Midgley, Esq.

Colonies and Trade.
William Lewis, Esq. F. L. S.
J. Spencer Smith, L. L. D.

Miscellaneous Matters.
Joseph Jacob, Esq.
William Kirby, Esq.

SECRETARY, Charles Taylor, M. D.
ASSISTANT SECRETARY, Mr. Thomas Woodfall.
HOUSEKEEPER, Miss A. B. Cockings.
COLLECTOR, Mr. Robert Elwin.

R. WILKS, PRINTER, 89, Chancery-lane.

ADVERTISEMENT TO THE PUBLIC.

THE chief objects of the SOCIETY are to promote the Arts, Manufactures, and Commerce of this Kingdom, by giving honorary or pecuniary Rewards, as seem to them best adapted to the case, for all such useful Inventions, Discoveries, and Improvements, (though not mentioned in this book) as tend to that purpose; and, in pursuance of this plan, the Society have already expended many THOUSAND POUNDS, advanced by voluntary subscriptions of their members, and legacies bequeathed.

The Register of the Premiums and Bounties they have given, which may be seen at the SOCIETY's house in the *Adelphi*, will show the very great advantages which the Public have derived from this Institution.

The meetings of the SOCIETY are held every *Wednesday*, at seven o'clock in the evening, from the fourth *Wednesday* in *October* to the first *Wednesday* in *June*. The several Committees meet on other evenings in the week during the session, as particularly mentioned in their printed book of Rules and Orders.

In order still farther to promote the laudable Views of the SOCIETY, it may be necessary to explain the mode by which members are elected.

Each member has the privilege, at the meetings of the SOCIETY, or by letter to the Secretary, to propose any person who is desirous to become a member, provided the proposal contains the name, with the full addition, and place of abode, of the proposed member, and is signed by three members of the SOCIETY.

Peers of the Realm or Lords of Parliament are, on their being proposed, immediately balloted for; the names of other persons proposed to become members are to be delivered to the Secretary, read at the next meeting of the SOCIETY, and then inserted in lists which are hung up in the Society's room: they are balloted for at the second following ordinary meeting. In both cases, if two-thirds of the members then voting ballot in their favour, they are deemed perpetual members upon payment of not less than Twenty Guineas in one sum, or subscribing members upon payment of any sum not less than Two Guineas annually.

All members are entitled to vote and assist in all the business of the SOCIETY, and the several Committees. The members have also the privilege of recommending two persons as auditors at the meetings of the SOCIETY, and by addressing a note to the housekeeper, of introducing their friends to examine the various Models, Machines, and Productions, in different branches of Arts, Manufactures, and Commerce, for which rewards have been bestowed; also to inspect the magnificent series of moral and historical Paintings, executed by the late J. BARRY, Esq. which, with some valuable Busts, Statues, &c. decorate the Great Room.

Members have the use of the Society's Library, which is valuable and annually increasing, from donations of scientific and useful books and engravings. The SOCIETY are highly sensible of the great importance of such acquisitions, and are happy to record them, with the names of the donors, in the Volume annually published of the SOCIETY's Transactions, to which the members are entitled.

Ladies are eligible as members of the SOCIETY, to all the Privileges thereof, and are alone entitled to vote by proxy at elections, through the medium of any gentleman who is a member, on his producing a written authority for the same.

The time appointed for admission to the Paintings or Models, is from ten to two o'clock, Sundays and Wednesdays excepted.

ORDERED, SOCIETY'S HOUSE, ADELPHI, JUNE 1st, 1809.

That the several Candidates and Claimants, to whom the Society shall adjudge Premiums or Bounties, do attend at the Society's House, in the Adelphi, on the last Tuesday, in May, 1810, at Eleven o'Clock in the Morning precisely, to receive the same; that Day being appointed by the Society for the Distribution of their Rewards: And before that time no Premium or Bounty will be delivered, excepting to those who are about to leave the Kingdom.

In cases where the Society may think fit to admit excuses for not attending in person, Deputies may be substituted to receive the Rewards, provided such Deputies are either Members of the Society, or superior Officers thereof.

PREMIUMS IN AGRICULTURE.

Article 1. Acorns.

FOR having set between the first of October, 1807, and the first of April, 1808, the greatest quantity of land, not less than ten acres, with acorns, with or without seeds, cuttings, or plants of other trees, at the option of the candidate; and for effectually fencing and preserving the same, in order to raise timber; the gold medal.

2. For the second greatest quantity of land, not less than five acres, set agreeably to the above conditions; the silver medal.

Certificates of setting agreeably to the above conditions, and that there are not fewer than three hundred young oaks on each acre, to be delivered to the Society on or before the first Tuesday in December, 1809.

3. Raising Oaks. To the person who shall have raised, since the year 1805, the greatest number of oaks, not fewer than five thousand, either from young plants or acorns, in order to secure a succession of oak timber in this kingdom; the gold medal.

4. For the next greatest number, not fewer than three thousand; the silver medal.

Certificates that there were on the land, at least the number of young oak trees required, in a thriving condition, two years after the planting, with an account of the methods pursued in making and managing the plantation, to be produced to the society on or before the first Tuesday in January, 1810

5. Ascertaining the best Method of raising Oaks. To the person who shall ascertain in the best manner, by actual experiments, the comparative merits of the different modes of raising oaks for timber, either from acorns set on land properly dug or tilled, from acorns set by the spade or dibble, without digging or tillage, either on a smooth surface, or among bushes, fern, or other cover; or from young plants previously raised in nurseries, and transplanted; regard being had to the expense, growth, and other respective advantages of the several methods; the gold medal.

The *accounts*, and proper *certificates*, that not less than one acre has been cultivated in each mode, to be produced to the Society on or before the first Tuesday in November, 1809.

6. Chesnuts. For having sown or set, between the first of October, 1807, and the first of April, 1808, the greatest quantity of land, not less than six acres, with Spanish chesnuts, with or without seeds, cuttings, or plants of other trees, adapted to such soil, at the option of the candidate; and for effectually fencing and preserving the same, in order to raise timber; the gold medal.

7. For the second greatest quantity, not less than four acres; the silver medal.

Certificates of sowing or setting, agreeably to the above conditions, and that there are not fewer than three hundred chesnut plants in a thriving state, on each acre, to be delivered to the Society on or before the first Tuesday in January, 1810.

8. Elm. For having planted the greatest number of the English elm, not less than eight thousand, between the twenty-fourth of June, 1807, and the twenty-fourth of June, 1808; and for having effectually fenced and preserved the same in order to raise timber; the gold medal.

9. For the second greatest number, not less than five thousand; the silver medal.

Certificates of having planted agreeably to the above conditions, that the plants were in a healthy and thriving state two years at least after making the plantation, and specifying the distance of the plants, to be delivered to the Society on or before the first Tuesday in April, 1810.

10. Larch. For having planted out, between the twenty-fourth of June, 1806, and the twenty-fourth of June, 1807, the greatest number of larch trees, not fewer than five thousand, and for having effectually fenced and preserved the same in order to raise timber; the gold medal.

11. For the next greatest number, not fewer than three thousand; the silver medal.

Certificates of the number of plants, that they were in a healthy and thriving state two years at least after they were planted out, with a general account of the methods used in making the plantation, to be delivered to the Society on or before the last Tuesday in December, 1809.

N. B. The larch trees may be planted, either mixed with other trees, or by themselves, as may best suit the convenience of the planter.

12. Ash. For having sown or set, in the year 1805, the greatest quantity of land, not less than six acres, with ash for timber, with or without seed, cuttings, or plants, of such other trees as are adapted to the soil; the gold medal.

13. For the next greatest quantity, not less than four acres; the silver medal.

Certificates of the sowing or setting, agreeably to the above conditions, that there are not fewer than six hundred ash plants on each acre, in a thriving and healthy condition, two years at least after the sowing or setting, with a general account of the methods used in making the plantation; to be delivered to the Society on or before the last Tuesday in December, 1809.

N. B. It is the intention of the Society, that such lands only as are not calculated for the purposes of Husbandry, should be employed for the purposes specified in these advertisements.

14. Forest trees. To the person who shall have enclosed and planted, or set, the greatest number of acres (not less than ten) of land, that is incapable of being ploughed, such as the borders of rivers, the sides of precipices, and any land that has too many rocks, or that is not calculated to repay the expense of tillage, owing to the surface be-

ing too hilly, mountainous, or otherwise unfit for tillage, with the best sorts of forest trees, namely, oak, Spanish chesnuts, ash, elm, beech, alder, willow, larch, spruce, and silver fir, with or without screens of Scotch fir, adapted to the soil, and intended for timber trees, between the first of October, 1806, and the first of April, 1807; the gold medal.

15. For the second greatest quantity of land, not less than seven acres; the silver medal.

A particular *account* of the methods used in making and managing the plantations, the nature of the soil, the probable number of each sort of plants, together with proper *certificates* that they were in a healthy and thriving state two years at least after making the plantation, to be delivered to the Society on or before the first Tuesday in December, 1809.

N. B. With the above forest trees, the seeds, cuttings, or plants, of such other trees as are adapted to the soil, and proper for underwood, may or may not be intermixed.

The candidates for planting all kinds of trees are to produce certificates that the respective plantations are properly fenced and secured, and particularly to state the condition of the plants at the time of signing such certificates. Any information which the candidates for the foregoing premiums may choose to communicate, relative to the methods made use of in forming the plantations, or promoting the growth of the several trees, or any other observations that may have occurred on the subject, will be thankfully received.

16. Securing Plantations of Timber Trees, and Hedge Rows. To the person who shall give to the Society the most satisfactory account, founded on experience, of the most effectual and least expensive method of securing young plantations of timber trees, and hedge rows, from hares and rabbits, as well as sheep and larger cattle, which at the same time shall be least subject to the depredations of wood-stealers; the silver medal.

The *accounts*, and *certificates* of the efficacy of the method, to be produced to the Society on or before the first Tuesday in December, 1809.

17. Comparative Culture of Wheat, broad-cast, drilled, and dibbled. For the best set of experiments, made on not less than twelve acres, four of which to be sown broad-cast, four drilled, and four dibbled, the two latter in equidistant rows, in order fully to ascertain which is the most advantageous mode of cultivating wheat; the gold medal.

It is required that every operation and expense of each mode of culture be fully described: and that proper *certificates* of the nature and condition of the land on which the experiments were made, together with an *account* of the produce of the corn, the weight per bushel, and also of the straw, be produced to the Society on or before the first Tuesday in February, 1810.

18. Beans and Wheat. To the person who shall have dibbled or drilled between the first of December, 1808, and the first of April, 1809, the greatest quantity of land, not less than ten acres, with beans, in equidistant rows, and hoed the intervals twice or oftener, and shall have sown the same land with wheat in the autumn of the year 1808; the gold medal.

It is required that an *account* of the sort and quantity of beans, the time of dibbling or drilling, and of reaping or mowing them, the produce per acre thrashed, the expense of dibbling or drilling, hand or horse hoeing, the distance of the rows, and the quality of the soil, together with *certificates* of the number of acres, and that the land was afterwards actually sown with wheat, be produced on or before the second Tuesday in March, 1810.

19. Beans. To the person who, in the year 1807, shall discover and cultivate, either by the drill or dibbling method, on not less than five acres, a species of horse-beans or tick-beans, that will ripen their seeds before the 21st of August; the silver medal.

It is required that a particular account of the bean, the cultivation, and the expense attending it, with proper *certificates* of the nature and condition of the land on which the experiments were made, together with an *account* of the produce, the weight per Winchester bushel, and a sample of not less than a peck, be produced to the Society on or before the first Tuesday in December, 1809. It is apprehended that if a bean should be brought into cultivation with the habits of the hotspur, or other early peas, that it would in a great measure escape the danger arising from the collier-insect, or other insects, and allow more time for the farmers to till the land for the subsequent crop of wheat. The *accounts* and *certificates* to be delivered on or before the first Tuesday in December, 1809.

20. Parsnips. To the person who in the year 1809, shall cultivate the greatest quantity of land, not less than five acres, with parsnips, for the sole purpose of feeding cattle or sheep; the gold medal.

Certificates of the quantity of land so cultivated, with a particular *account* of the nature of the soil and weight of the produce on sixteen perches, and also of the condition of the cattle or sheep fed with the parsnips, and the advantages resulting from the practice, to be produced to the Society on or before the second Tuesday in February, 1810.

21. Buck Wheat. To the person who shall cultivate the greatest quantity of land with buck wheat, not less than thirty acres; the gold medal.

It is required that the time of sowing and reaping be noticed; also a particular *account* of the species, cultivation, and expense attending it, the manner of reaping it, thrashing it, and housing the grain; with proper

certificates of the nature and condition of the land on which the experiments were made, and the name of the crop, if any, which the same land bore the preceding year, together with an *account* of the produce, and a sample of the seed, not less than a quart, be produced to the Society on or before the second Tuesday in January, 1810.

22. For the next greatest quantity, not less than fifteen acres, on similar conditions; the silver medal.

Information respecting its application to the feeding of cattle, hogs, and poultry, and other of its uses, is also desired. It is known to be particularly serviceable in furnishing honey to bees.

23. Raising Grass Seeds. To the person who shall raise the greatest quantity of each of any of the following named grass seeds, *viz.*—Meadow fox-tail (alopecurus pratensis), sweet-scented vernal grass (anthoxanthum odoratum), Timothy grass (phleum pratense), meadow fescue grass (festuca pratensis), smooth-stalked meadow grass (poa pratensis), rough-stalked meadow grass (poa trivialis); the silver medal.

It is required that *certificates* from persons who have viewed them in a proper state, to identify that they are one or other of the seeds above-mentioned, indicating clearly the particular species, and noticing the quantity produced of such seeds, free from weeds or mixture of other grasses, together with proper samples of the seeds, be produced to the Society on or before the first day of February, 1810.

24. Preserving Turnips. To the person who shall discover to the Society the best and cheapest method of preserving turnips perfectly sound, and in every respect fit for the purpose of supporting and fattening sheep and neat cattle during the months of February, March, and April; the gold medal.

It is required that a full and accurate *account* of the method employed, and the expense attending the process, together with *certificates* that the produce of four acres at the least have been preserved according to the method described, and applied to the feeding of sheep and neat cattle; that the whole were drawn out of the ground before the first day of February, in order to clear the greater part of it previous to its being prepared for corn, and to save the soil from being exhausted by the turnips; and also of the weight of an average sixteen perches of the crop; be produced to the Society on or before the first Tuesday in December, 1809.

25. For the next in quantity and merit, on not less than two acres; the silver medal.

26. Preserving Cabbages. To the person who shall discover to the Society the best and cheapest method of preserving drum-headed cabbages perfectly sound, and in every respect fit for the purpose of supporting and fattening sheep and neat cattle during the months of February, March, and April; the gold medal.

27. For the next in quantity and merit, on not less than two acres; the silver medal.

Conditions the same as for preserving turnips, Art. 24. And the *accounts* to be produced on or before the first Tuesday in December, 1809.

28. Preserving Carrots, Parsnips, or Beets. To the person who shall discover to the Society the best and cheapest method of preserving carrots, parsnips, or beets, perfectly sound, and in every respect fit for the purpose of supporting horses, and fattening sheep and neat cattle, during the months of February, March, and April; the gold medal.

Conditions the same as for preserving turnips, Art. 24. And the *accounts* to be delivered in on or before the first Tuesday in December, 1809.

29. For the next in quantity and merit, on not less than two acres: the silver medal.

30. Preserving Potatoes. To the person who shall discover to the Society the best and cheapest method of preserving potatoes, two or more years, perfectly sound, without vegetating, and in every other respect fit for the purpose of sets and the use of the table, and consequently of supporting and fattening cattle; the gold medal, or thirty guineas.

It is required that a full and accurate *account* of the method employed, and the expense attending the process, with *certificates* that one hundred bushels at the least have been preserved according to the method described, and that one or more bushels of the same potatoes have been set, and produced a crop without any apparent diminution of their vegetative power, and also that they have been used at table, with entire satisfaction to the person who eat of them, together with a sample of one bushel, be sent to the Society on or before the first Tuesday in December, 1809.

31. For the next greatest quantity, not less than fifty bushels; the silver medal.

32. Making Meadow-Hay in wet Weather. To the person who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of making meadow-hay in wet weather; the gold medal.

A full *account* of the method employed, and of the expense attending the process, with not less than fifty-six pounds of the hay; and *certificates* that at least the produce of six acres of land has been made according to the method described, and that the whole is of equal quality with the sample; to be produced on or before the first Tuesday in January, 1809.

33. Harvesting Corn in wet Weather. To the person who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of harvesting corn in wet weather; the gold medal.

A full *account* of the method employed, and of the expense attending the process, with not less than two sheaves of the corn, and *certificates* that at least the produce of ten acres has been harvested according to the method described, and that the whole is of equal quality with the samples, to be produced on or before the first Tuesday in January, 1810.

34. Gaining Land from the Sea. To the person who shall produce to the Society an account, verified by actual experiment, of his having gained the greatest quantity of land from the sea, not less than fifty acres, on the coast of Great Britain or Ireland; the gold medal.

Certificates of the quantity of land, and that the experiments were begun after the first of January, 1803, to be produced to the Society on or before the last Tuesday in November, 1809.

35. The same premium is extended one year farther.

Certificates to be produced on or before the last Tuesday in November, 1810.

36. Improving Land lying Waste. For the most satisfactory *account* of the best method of improving any of the following soils, being land lying waste or uncultivated, *viz.* clay, gravel, sand, chalk, peat-earth, or bog, verified by experiments on not less than fifty acres of land; the gold medal.

37. For the next greatest quantity, not less than thirty acres; the silver medal.

It is required, that the land, before such improvement, be absolutely uncultivated, and in a great measure useless, and that, in its improved state, it be enclosed, cultivated, and divided into closes.

Certificates of the number of acres, of the quality of the land so improved, with a full *account* of every operation and expense attending such improvement, the state it is in as to the proportion of grass to arable, and the average value thereof, to be produced on or before the first Tuesday in February, 1810.

38. Manures. For the most satisfactory set of experiments, to ascertain the comparative advantages of the following manures, used as top-dressings on grass and corn land, *viz.* soot, coal-ashes, wood-ashes, lime, gypsum, night-soil, or any other fit article; the gold medal. It is required that the above experiments be made between two or more of the above-mentioned manures, and that no less than two acres of land be dressed with each manure.

An *account* of the nature of the soil, quantity, and expense of the manure and crops, with *certificates*, to be produced on or before the last Tuesday in February, 1810.

39. Raising Water for the Irrigation of Land. To the person who shall discover to the Society the cheapest and most effectual method of raising water in quantities sufficient to be beneficially employed for the purpose of irrigating land, superior to, and cheaper than any other method now in use; the gold medal, or fifty guineas.

A model, on a scale of one inch to a foot, with *certificates* that a machine at large, on the same construction, has been used, specifying the quantity of water delivered in gallons per hour, and the height to which it was raised, to be produced to the Society on or before the first of March, 1810.

40. Paring Plough. To the person who shall invent and produce to the Society a machine or plough for the purpose of paring land preparatory to burning, superior to any hitherto known, or in use for such purpose, and to be worked by not more than one man and two horses; the silver medal, or twenty guineas.

The machine, and *certificates* that at least three acres have been pared by it in a proper manner, to be produced to the Society on or before the first of January, 1810.

41. Machine for Dibbling Wheat. To the person who shall invent a machine, superior to any hitherto known or in use, to answer the purpose of dibbling wheat, by which the holes for receiving the grain may be made at equal distances and proper depths; the silver medal and ten guineas.

The *machine*, with *certificates* that at least three acres have been dibbled by it, to be produced to the Society on or before the second Tuesday in January, 1810.

42. Machine for Reaping or Mowing Corn. For inventing a machine to answer the purpose of mowing or reaping wheat, rye, barley, oats, or beans, by which it may be done more expeditiously and cheaper than by any method now practised, provided it does not shed the corn or pulse more than the methods in common practice, and that it lays the straw in such a manner that it may be easily gathered up for binding: the gold medal.

The *machine*, with *certificates* that at least three acres have been cut by it, to be produced to the Society on or before the second Tuesday in December, 1809. Simplicity and cheapness in the construction of this and the preceding machine, will be considered as principal parts of their merit.

43. Thrashing Machine. To the person who shall invent a machine by which corn of all sorts may be thrashed more expeditiously, effectually, and at a less expense, than by any method now in use; the gold medal.

The *machine*, or a model, with proper *certificates* that such a machine has been usefully applied, that at least thirty quarters have been thrashed by it, and of the time employed in the operation, to be produced to the Society on or before the last Tuesday in February, 1810.

44. Destroying the Grub of the Cockchafer. To the person who shall dis-

cover to the Society an effectual method, verified by repeated and satisfactory trials, of destroying the grub of the cockchafer, or of preventing or checking the destructive effects which always attend corn, peas, beans, and turnips, when attacked by those insects; the gold medal.

The *accounts*, with proper *certificates*, to be produced on or before the first Tuesday in January, 1810.

45. Destroying Worms. To the person who shall discover to the Society an effectual method, verified by repeated and satisfactory trials, of destroying worms, or of preventing the destructive effects they occasion on corn, beans, peas, or other pulse; the silver medal.

The *accounts*, with proper *certificates*, to be produced to the Society on or before the first Tuesday in January, 1810.

46. Destroying the Fly on Hops. To the person who shall discover to the Society an easy and efficacious method of destroying the fly on hops, superior to any hitherto known or practised, on not less than four acres of hop ground; the gold medal.

Accounts and *certificates* to be delivered to the Society on or before the first Tuesday in February, 1810.

47. Preventing the Blight, or Ravages of Insects, on Fruit-Trees and Culinary Plants. To the person who shall discover to the Society the most effectual method of preventing the blight or ravages of insects on fruit-trees and culinary plants, superior to any hitherto known or practised, and verified by actual and comparative experiments: the silver medal.

The *accounts*, with proper *certificates*, to be delivered to the Society on or before the second Tuesday in December, 1809.

48. Cure of the Rot in Sheep. To the person who shall discover to the Society the best and most effectual method of curing the rot in sheep, verified by repeated and satisfactory experiments; the gold medal.

It is expected that the candidates furnish accurate *accounts* of the symptoms and cure of the disease, together with the imputed cause thereof, and the actual or probable means of prevention, which, with proper *certificates*, must be delivered to the Society on or before the first Tuesday in February, 1810.

49. Cure of the Foot-Rot in Sheep. To the person who shall discover to the Society the best and most effectual method of curing the foot-rot in sheep; the silver medal.

It is required that the cure be acertained by repeated and satisfactory experiments, and the method of performing it be verified by proper *certificates* delivered to the Society on or before the first Tuesday in February, 1810.

50. Preventing the ill Effects of Flies on Sheep. To the person who shall discover to the Society the most effectual method of protecting sheep from being disturbed and injured by flies; the silver medal.

It is required that the method be ascertained by repeated experiments, and that a *certificate* of its efficacy be delivered to the Society on or before the first Tuesday in December, 1809.

51. Protecting Sheep. To the person who, in the year 1808, shall protect the greatest number of sheep, not fewer than one hundred, by hovels, sheds, or any other means, and give the most satisfactory account, verified by experiment, of the advantages arising from the practice of protecting sheep from the inclemency of the weather, by hovels, sheds, or any other means; the gold medal.

A particular *account* of the experiments made, with the advantages arising therefrom, together with the expense, and *certificates* of its utility, to be produced to the Society on or before the first Tuesday in March, 1810.

N B. It is required that the *certificates* shall specify the length of time the sheep were so protected, and the manner in which they were maintained during that time; together with the general method of managing them.

52. Culture of Hemp in certain parts of Scotland. The Society wishing to encourage the growth of hemp for the use of the navy in every part of the united Empire, offer to the person who shall sow with hemp, in drills at least eighteen inches asunder, the greatest quantity of land in any part of the united Empire, not less than fifty acres statute measure, in the year 1809, and shall at the proper season cause to be plucked the summer hemp, (or male hemp bearing no seed) and continue the winter hemp (or female hemp bearing seed) on the ground until the seed is ripe; the gold medal.

53. To the person who shall sow with hemp, in drills at least eighteen inches asunder, the next greatest quantity of land in any part of the united Empire, not less than twenty-five acres, statute measure, in the year 1808, and shall at the proper season cause the same to be plucked as above-mentioned; the silver medal.

Certificates of the number of acres, of the distance of the drills, of the plucking of the hemp, with a general *account* of the soil, cultivation, and produce, to be delivered to the Society, along with fourteen pounds of the hemp and two quarts of the seed, on or before the second Tuesday in January, 1810.

54. Feeding of Cattle. For the best experiments on stall feeding of cattle (not less than five head) to be continued for the space of twelve months, in order to prove the earliest maturity and greatest propensity to fatten, of the most approved breeds of cattle in Great Britain, specifying the nature of the food given, together with the daily consumption of each beast, with its weekly increase in weight, and such other observations

as may be deemed of consequence; the gold medal.

A full *account* of the methods employed, and of the expenses attending the same, and *certificates* of the sundry matters stated to be produced on or before the second Tuesday in January, 1811.

N. B. *Such of the foregoing premiums as are not already mentioned to be continued for two years, are to be extended to that period, on similar conditions.*

PREMIUMS FOR DISCOVERIES AND IMPROVEMENTS IN CHEMISTRY, DYING, AND MINERALOGY.

55. Preserving Seeds of Vegetables. For the best method of preserving the Seeds of plants in a state fit for vegetation a longer time than has hitherto been practised, such method being superior to any known to the public, and verified by sufficient trial, to be communicated to the Society on or before the first Tuesday in December, 1809; the gold medal, or thirty guineas.

56. Preventing the Dry-Rot in Timber. To the person who shall discover to the Society the cause of the dry-rot in timber, and disclose a certain method of prevention superior to any hitherto known; the gold medal, or thirty guineas.

The *accounts* of the cause, and method of prevention, confirmed by repeated experiments, to be produced to the Society on or before the second Tuesday in Dec. 1809.

57. Preserving salted Provisions from becoming rancid or rusty. To the person who shall discover to the Society the best, cheapest, and most efficacious method of preserving salted provisions from growing rancid or rusty; the gold medal, or thirty guineas.

A full *description* of the method, with proper *certificates* that it has been found on repeated trials, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in February, 1810.

58. Refining Whale or Seal Oil. For disclosing to the Society an effectual method of purifying whale or seal oil from the glutinous matter that incrusts the wicks of lamps, and extinguishes the light, though fully supplied with oil; the gold medal, or fifty guineas.

It is required that the whole of the process be fully and fairly disclosed, in order that satisfactory experiments may be made by the Society to determine the validity of the claim; and *certificates* that not less than twenty gallons have been purified according to the process delivered in, together with two gallons of the oil, in its unpurified state and two gallons so refined, to be produced to the Society on or before the second Tuesday in February, 1810.

59. Manufacturing Tallow Candles. To the person who shall discover to the Society a method of hardening or otherwise preparing tallow, so that candles may be made of it which will burn as clear and with as small a wick as wax candles, without running, and may be afforded at a less expense than any at present made with spermaceti; the gold medal, or thirty guineas.

Certificates that 112lb. of such tallow have been made into candles, and 12lb. of the candles made thereof, to be produced to the Society on or before the second Tuesday in January, 1810.

60. Candles from Resin or other Substances. To the person who shall discover to the Society the best method of making candles of resin, or any other substance, fit for common use, at a price much inferior to those made of tallow only; the gold medal, or thirty guineas.

Six pounds at least of the candles so prepared, with an *account* of the process, to be delivered to the Society on or before the first Tuesday in December, 1809.

61. Method of separating Sugar in a solid Form from Treacle. To the person who shall discover to the Society the best method of separating sugar from treacle, in a solid form, at such an expense as will render it advantageous to the public; the gold medal or fifty guineas.

A quantity of the sugar so prepared, in a solid form, not less than thirty pounds weight, with an *account* of the process, and *certificates* that not less than one hundred weight has been prepared, to be produced to the Society on or before the first Tuesday in February, 1810.

62. Increasing Steam. To the person who shall invent and discover to the Society a method, verified by actual experiments, of increasing the quantity or force of steam, in steam-engines with less fuel than has hitherto been employed, provided that in general the whole amount of the expenses in using steam-engines may be considerably lessened; the gold medal, or thirty guineas.

To be communicated to the Society on or before the first Tuesday in January, 1810.

63. Substitute for Tar. To the person who shall invent and discover to the Society the best substitute for Stockholm tar, equal in all its properties to the best of that kind; and prepared from materials the produce of the united Kingdom and its Colonies; the gold medal, or one hundred guineas. A quantity of the substitute, not less than one hundred weight, with *certificates* that at least one ton has been manufactured, and that it can be afforded at a price not exceeding that of the best foreign tar, together with an *account* of the process, to be delivered to the Society on or before the first Tuesday in March, 1810.

64. Preparation of Tan. To the person who shall prepare, in the most concentrated form, so as to be easily portable, and at a price applicable to the purposes of manufacturers, the largest quantity, not less

than one hundred weight, of the principle called by the French *tannin*, which abounds in oak-bark and many other vegetable substances: the gold medal, or thirty guineas.

Certificates of the superior quality of the quantity so prepared, and a sample of not less than 28lb. to be produced to the Society on or before the last Tuesday in January, 1810.

65. Indelible Ink. To the person who shall discover to the Society a method of making a black ink proper for writing, superior to any at present known, indestructible by chemical applications, and not dearer than that which is now in common use; the silver medal, or fifteen guineas.

Certificates that not less than two gallons of such ink have been actually prepared, and found to possess the qualities above mentioned, with a full detail of the process of making it, and two quarts of the ink, to be delivered to the Society on or before the second Tuesday in January, 1810.

66. Preparation of a red Stain for Cotton Cloth. To the person who shall communicate to the Society the cheapest and most effectual method of printing or staining cotton cloths with a red colour, by an immediate application of the colouring matter to the cloth, equally beautiful and durable with the red colours now generally procured from decoctions of madder; the gold medal, or thirty guineas.

Certificates that the above process has been advantageously used on ten pieces of calico, each twenty-one yards or upwards in length; one piece of the calico so printed, a quart of the colour in a liquid state, and a full *account* of the preparation and application, to be produced to the Society on or before the second Tuesday in January, 1810.

67. Preparation of a green Colour for painting cotton Cloth. To the person who shall communicate to the Society the best and cheapest method of printing with a full green colour on cotton cloth, by an immediate application of the colouring matter from a wooden block to the cloth, equally beautiful and durable as the colours now formed from the complicated process of the decoction of weld on alumine, and the solutions of indigo by earths or alkaline salts; the gold medal, or thirty guineas.

Certificates and conditions as for premium 66.

68. Rendering Muslin less combustible. To the person who shall discover to the Society a method of rendering muslin less combustible, to be effected by a cheaper and more effectual mode than any hitherto known; the silver medal.

Specimens of the muslin so prepared, with a full account of the process employed for the purpose, to be produced to the Society on or before the first Tuesday in February, 1810.

N. B. It is expected that the means employed shall neither injure the quality of the muslin, stain it, nor damage any print or dye with which it may be coloured.

69. Substance for the Basis of Paint. To the person who shall produce to the Society the best substitute, superior to any hitherto known, for the basis of paint, equally proper for the purpose as the white-lead now employed; such substitute not to be of a noxious quality, and to be afforded at a price not materially higher than that of white lead; the gold medal, or one hundred guineas.

A quantity of the substitute, not less than 50lb. weight, with an *account* of the process used in preparing it, and *certificates* that at least one hundred weight has been manufactured, to be produced to the Society on or before the first Tuesday in January, 1810.

70. Red Pigment. To the person who shall discover to the Society a full and satisfactory process for preparing a red pigment, fit for use in oil or water, equal in tone and brilliancy to the best carmines and lakes now known or in use, and perfectly durable; the gold medal, or thirty guineas.

One pound weight of such colour, and a full disclosure of its preparation, to be produced to the Society on or before the first Tuesday in February, 1810.

N. B. It is not required that the colour should resist the action of fire or chemical applications, but remain unaltered by the common exposure to strong light, damps, and noxious vapours.

71. Ultramarine. To the person who shall prepare an artificial ultramarine, equal in colour, brilliancy, and durability, to the best prepared from lapis lazuli, and which may be afforded at a cheap rate; the gold medal, or thirty guineas.

The conditions are the same as in the preceding premium for the red pigment.

72. Blue Pigment from Iron. To the person who shall invent, and discover to the Society, the best blue pigment from iron, superior to Antwerp or Prussian blue in colour and durability, fit for use in oil or water, which may be afforded at a cheap rate; the gold medal, or thirty guineas.

One pound weight of the colour, and a full disclosure of its preparation, to be produced to the Society on or before the first Tuesday in February, 1810.

N. B. It appears from the analysis of lapis lazuli by Klaproth, and the experiments of Gayton, (related in the Annales de Chemie) that ultramarine is a blue sulphurat of iron, and that a blue substance much resembling it is constantly found amongst the scoriæ of blast furnaces where iron is reduced, the Society by offering the above premium wish to call the attention of persons to these facts, and encourage them to make experiments, in the hope of producing a blue pigment which may be substituted for ultramarine.

73. Destructive Effects from Moths,

To the person who shall discover to the Society a cheap, easy, and effectual method, verified by repeated and satisfactory trials, of preventing the destructive effects occasioned by moths and other insects, in furs, woollens, and other articles, superior to any hitherto known or practised; the silver medal, or fifteen guineas.

The *accounts*, with proper *certificates*, to be produced to the Society on or before the first Tuesday in January, 1810.

74. Statuary Marble. To the person who shall discover, within Great Britain or Ireland, a quarry of white marble fit for the purposes of statuary, and equal in all respects to those kinds now imported from Italy; the gold medal, or one hundred pounds.

A block of at least three feet in length, two in height, and two in width, with an account of the situation of the quarry, and *certificates* of its possessing considerable extent, to be produced to the Society on or before the first Tuesday in February, 1810.

N. B. In order to prevent useless expense or trouble to the claimant in forwarding so large a block, the Society will be ready to examine any smaller specimen of the marble, and express their opinion of its value to the candidate before the block required by the above premium is produced.

75. Preparation of Sulphuric Acid, from Sulphur without the Use of any Nitric Salt. To the person who shall prepare the largest quantity (not less than one ton) of sulphuric acid from sulphur without any nitric salt, of a specific gravity not inferior to the best sulphuric acid of commerce; the gold medal, or fifty guineas.

Certificates that not less than the above quantity of such an acid has been prepared, together with a sample, to be produced to the Society on or before the first Tuesday in January, 1810.

76. Preparation of any Alkaline or Earthen Nitrate. To the person who shall prepare, in Great Britain, the largest quantity, not less than one hundred weight, of any salt of nitric acid, with either earths or alkalis, by a method superior to, and as cheap as those hitherto practised; the gold medal, or one hundred guineas.

Certificates of the above quantity having been prepared, and a sample of not less than 28lb. to be produced to the Society on or before the last Tuesday in January, 1810.

77. Fine Bar Iron. To the person, in Great Britain, who shall make the greatest quantity of bar-iron, not less than ten tons, with coak, from coak pigs, equal in quality to the best iron imported from Sweden or Russia, and as fit for being converted into steel; the gold medal, or fifty guineas.

Samples, not less than one hundred weight, with *certificates* that the whole quantity is of equal quality, to be produced to the Society on or before the first Tuesday in January, 1810.

78. Preserving Iron from Rust. To the person who shall invent and discover to the Society a cheap composition, superior to any now in use, which shall effectually preserve wrought iron from rust; the gold medal, or fifty guineas.

A full description of the method of preparing the composition, with *certificates* that it has stood at least two years unimpaired, being exposed to the atmosphere during the whole time, to be produced to the Society, with ten pounds weight of the composition, on or before the first Tuesday in January, 1810.

79. Refining Block Tin. To the person who shall discover to the Society the best method of purifying or refining block-tin, so as to render it fit for the finest purposes to which grain-tin is now applied, and not higher in price; the gold medal, or fifty guineas.

Certificates that not less than three tons have been so refined or purified, with a full detail of the process, and a quantity, not less than one hundred weight, of the tin so refined, to be produced to the Society on or before the first Tuesday in January, 1810.

80. Glazing Earthen-Ware without Lead. To the person who shall discover to the Society the cheapest, safest, most durable, and most easily fusible composition, fit for the purpose of glazing the ordinary kinds of earthen-ware, without any preparation of lead, and superior to any hitherto in use; the gold medal, or thirty guineas.

Specimens of the ware so glazed, with proper *certificates* of its having succeeded, and a sample of the materials made use of, to be produced to the Society on or before the first Tuesday in February, 1810.

81. Refining Copper from the Ore. To the person who shall discover to the Society the best method of separating, purifying, and refining copper from the ore, so as to render it fit for the finest purposes to which fine copper is now applied, and by a process superior to any hitherto known or in use, and not higher in price; the gold medal, or fifty guineas.

Certificates that not less than three tons have been so prepared or refined, and a quantity not less than one hundred weight of the copper so refined, to be produced to the Society on or before the first Tuesday in February, 1810.

82. Mineralogical Map of England and Wales. To the person who shall complete and publish an accurate mineralogical map of England and Wales, on a scale of not less than ten miles to an inch, containing an account of the situation of the different mines therein, and describing the kinds of minerals thence produced; the gold medal, or fifty guineas.

Certificates of the accuracy of such map,

together with the map, to be produced to the Society on or before the first Tuesday in February, 1810. The map to remain the property of the Society.

83. Mineralogical Map of Ireland. The same premium is offered for a mineralogical map of Ireland, on similar conditions.

84. Mineralogical Map of Scotland. The same premium is offered for a mineralogical map of Scotland, on similar conditions.

85. Natural History. To the author who shall publish, in the year 1809, the natural history of any county in England, or Wales; the gold medal, or fifty guineas.

It is required that the several natural productions, whether animal or vegetable, or mineral, peculiar to the county, or found therein, be carefully and specifically arranged and described, in order that the public may be enabled to judge what arts or manufactures are most likely to succeed in such county. The work to be delivered to the Society on or before the last Tuesday in January, 1810.

PREMIUMS IN POLITE ARTS.

86. Honorary Premiums for Drawings by Nobility. For the best original drawing of any kind, by young gentlemen under the age of twenty-one, sons or grandsons of peers or peeresses in their own right, of Great Britain or Ireland; the honorary medal of the Society in gold.

87. The silver medal for the best copy.

88—89. The same premiums will be given, on the like conditions, to young ladies, daughters or grand-daughters of peers or peeresses in their own right, of Great Britain or Ireland.

90. Honorary Premiums for Drawings by Gentlemen. For the best original drawing of any kind, by young gentlemen under the age of twenty one; the gold medal.

91. For the best copy, the silver medal.

92—93. The same premiums will be given for drawings by young ladies.

N. B. As the foregoing honorary premiums are intended only for such of the nobility and gentry as may hereafter become patrons or patronesses of the arts; persons professing any branch of the polite arts, or any business dependent on the arts of design, or the sons or daughters of such persons, will not be admitted candidates in these classes.

94. Premiums for Drawings in General. For the best original drawing of any kind, by persons of either sex, under the age of twenty-one; the gold medal.

95. For the best copy, the silver medal.

96. Historical Drawings. For the best historical drawing, being an original composition of three or more human figures, the height of the principal figure not less than eight inches, by persons of either sex under twenty-one years of age; the gold medal.

97. For the next in merit; the silver medal.

98 Drawings of Outlines. For the best outline, after the plaster cast, of any antique statue, by persons of either sex under the age of twenty-one, the figure not less than eighteen inches; the silver medal.

99. Paintings in Oil. For the best painting in oil, of a landscape after nature, the size thirty-six by twenty-eight inches; by persons of either sex, under twenty-five years of age; the gold medal.

100. For the next in merit, the silver medal. Each candidate must mention from whence the view was taken.

101. Drawings of Landscapes. For the best drawing, in water-colours, of a landscape after nature, not less than eighteen inches by twelve, by persons of either sex, under twenty-one years of age; the silver medal.

102. Drawings by Engraver's Pupils. For the best finished drawing of the fighting Gladiator, from a cast the size of the original marble, the size of the drawing not less than eighteen inches, by persons under twenty-one years of age; the silver medal.

103. Engraving of Portraits. To the person who shall complete the best portrait engraved in the line manner; the gold medal.

It is required that two impressions of the engraving be produced, and to remain the property of the Society.

104. For the next in merit: the silver medal, on similar conditions.

105. Line Engravings of Historical Subjects. For the best historical engraving of any size; the gold medal.

106. For the next in merit; the silver medal.

107. Line Engravings of Landscapes. For the best line engraving of a landscape; the gold medal.

108. For the next in merit; the silver medal.

N. B. It is not necessary, in the classes of line engravings, for the artist's name to be concealed. The first aquafortis proof, is required to be sent in with two finished impressions. The aquafortis proof and the two impressions, to remain the property of the Society.

109. Perspective Drawings of Machines. For the best perspective drawings of machines, by persons under twenty-one years of age; the silver medal.

110. Engraving on Wood or Metal Blocks, &c. For the best engraving on wood or metal blocks of an historical subject; the size of the principal figure not less than six inches in height, and the block to be at least twelve inches by nine; the gold medal.

Two or more impressions, with the block, to be produced to the Society. The impres-

sions, but not the block, to remain the property of the Society.

111. For the next in merit; the silver medal, on similar conditions.

112. Bronzes. For the best drapery figure or group cast in bronze; if a single figure, not less than twelve inches high; and if a group, not less than nine inches: and which will require the least additional labour to repair; the gold medal, or the silver medal and twenty guineas.

The cast to be exhibited to the Society before it is begun to be repaired, with the original figure or group, together with a full explanation of the whole process.

113. Medal Die Engraving. For the best die engraving of one or more heads after the engraver's own model; the gold medal.

114. For the next in merit; the silver medal.

115. For the best die engraving of one figure or a group consisting of not more than three figures, after the engraver's own model; the gold medal.

116. For the next in merit; the silver medal.

The dies, and two impressions or casts, and the model, in each claim for medal die sinking to be produced to the Society. The impressions or casts, but not the model or die, to remain the property of the Society.

117. Architectural Designs. For the best original design of an academy of arts, consisting of plan and elevation; the gold medallion. The drawing to remain the property of the Society.

For the next in merit; the silver medallion, on similar conditions.

The following inscription to be engraved on these medallions: *The Premium given by the Society for the Encouragement of Arts, Manufactures, and Commerce, in conformity to the Will of John Stock, of Hampstead, esq.*

118. Etching of an Historical Picture. For the best finished etching of an historical picture; the gold medal.

119. Etching of a Landscape. For the best finished etching of a landscape, from a picture; the silver medal.

CONDITIONS.

FOR THE POLITE ARTS.

All the claims under this class are to be produced to the Society on or before the last Tuesday in February, 1810, and no other articles in the class of Polite Arts to be admitted into the Society with a view to bounties after the last Tuesday in March.

No person who has gained the first premium in any class shall be admitted a candidate in a class of inferior age; and no candidate shall receive more than one premium in one year.

No person shall be admitted a candidate in any class, who has already obtained the first premium in that class.

No more than one performance in any class shall be received from the same candidate.

All performances (to which premiums or bounties are adjudged) shall remain with the Society until the first Wednesday in June, 1810, when they will be re-delivered, unless mentioned in the premiums to the contrary.

No performance shall be admitted, that has obtained a premium, reward, or gratification, from any other society, or academy, or been offered for that purpose.

All performances that obtain premiums in the Polite Arts must have been begun after the publication of such premiums, except line engravings.

It is required, that the matters for which premiums are offered, be delivered in without names, or any intimation to whom they belong; that each particular thing be marked in what manner each claimant thinks fit, such claimant sending with it a paper sealed up, having on the outside a corresponding mark, and on the inside the claimant's name, residence, and age; which paper is not to be opened unless the candidate be successful, or by a special vote of the Society.

To encourage real merit; and prevent attempts to impose on the Society, by producing drawings made or retouched by any other person than the candidate, the Society require a specimen of the abilities of each successful candidate, under the inspection of the Committee of Polite Arts, in every instance where such proof may appear necessary.

All candidates in the Polite Arts are required to signify, on their drawings, whether the performances are originals or copies; and if copies, whence they were taken, and to mark thereon the class for which each is intended.

PREMIUMS FOR ENCOURAGING AND IMPROVING MANUFACTURES.

120. Cloth from Hop-Stalks, &c. To the person who shall produce to the Society the greatest quantity, not less than 30 yards of cloth, at least 27 inches wide, made in Great Britain or Ireland, of hop-stalks or bines, or other raw vegetable substances, the produce of Great Britain or Ireland, superior to any hitherto manufactured from such substances, and which can be generally afforded as cheap as cloth of equal quality and appearance now made from hemp, flax, or cotton, and much finer in quality than any hitherto manufactured in England from hop-stalks, &c.; the gold medal, or thirty guineas.

One pound of the thread of which the cloth is made, and thirty yards of the cloth, together with proper *certificates* that the whole is manufactured from hop-stalks or bines, &c. to be produced to the Society on

or before the first Tuesday in December, 1809.

N. B. The Society is already in the possession of cloth made in England from hop-stalks or bines, which may be inspected by application to the Housekeeper.

121. Sheep's Wool. To the Person who shall prove to the Society that he has sold the largest quantity of Merino wool, or such wool as will answer the same purposes, being the produce of his own flock, for the purpose of being manufactured into superfine cloth, the quantity of wool, not less than five hundred weight, in the year 1809; the gold medal.

Certificates, along with samples of the wool and of cloth manufactured from it, to be produced to the Society on or before the last Tuesday in March, 1810.

For the next greatest quantity, not less than two hundred and fifty pounds; the silver medal, on similar conditions.

122. Hog's Bristles. To the person who shall prepare the greatest quantity of bristles, from swine bred in the united kingdoms, equal in quality to those imported from Russia or Prussia, and at as cheap a rate; the silver medal, or fifteen guineas.

Certificates, that not less than one hundred weight have been so prepared, and a sample of not less than fourteen pounds of such bristles, to be produced to the Society on or before the last Tuesday in February, 1810.

123. Wicks for Candles or lamps. To the person who shall discover to the Society a method of manufacturing hop-stalks or bines, or any other cheap material, the growth of Great Britain, so as to render them equally fit for the purpose of supplying the place of cotton, for wicks of candles or lamps; twenty guineas.

Samples, not less than five pounds weight, of the wick so prepared, to be produced to the Society on or before the last Tuesday in December, 1809, with *certificates* that the whole quantity is equal in quality to the sample.

124. Experiments to ascertain the proper Thickness of Wicks for Candles. To the person who shall make known to the Society the most satisfactory result of a series of experiments, actually made by him to determine the best thickness of cotton wicks for candles, so as to obviate the defects of those commonly used; the silver medal, or ten guineas.

Certificates, that not less than one hundred weight have been so made, and six pounds of the candles, to be produced to the Society on or before the last Tuesday in February, 1810.

N. B. The intention in offering this premium, is to ascertain the proper thickness or bulk of the wick in proportion to that of the tallow, and to remove the unpleasant consequences and waste arising from the sparkling, or guttering of the candles in common use.

125. Paper from raw Vegetable Substances. To the person in Great Britain, or Ireland, who shall, between the first of January, 1809, and the first of January, 1810, make the greatest quantity, and of the best quality, (not less than ten reams) of good and useful paper, from raw vegetable substances, the produce of Great Britain or Ireland, of which one hundred weight has not been used in manufacturing paper, previous to January, 1808, superior to any hitherto manufactured from such substances, and which can be generally afforded as cheap as paper of equal quality and appearance now made from rags; twenty guineas.

N. B. The object of the Society being to add to the number and quantity of raw materials used in this manufacture, it is their wish to include every useful sort of paper, and to introduce such natural products as can be easily and cheaply procured in great quantities. The Society are in possession of two volumes containing a great variety of specimens of paper made from raw vegetable substances, viz. nettles, potatoe-haulm, poplar, hop-bines, &c. which volumes may be inspected by any person on application to the Housekeeper.

Certificates of the making such paper, and one ream of the paper, to be produced on or before the second Tuesday in January, 1810.

126. Transparent Paper. To the person who shall discover to the Society a method of making paper from the pulp, that shall be perfectly transparent, and of a substance and body equal to foolscap, that shall take and bear common writing-ink, with the same facility and correctness as writing paper generally in use; the silver medal, or twenty guineas.

Certificates of the making such paper, an *account* of the process, and one ream of the paper, to be produced on or before the second Tuesday in January, 1810.

127. Chintz Patterns for Calico-Printers. For the best original pattern in a new taste, of light and dark-ground chintz for garment-work, or furniture, fit for the purposes of calico-printers, by persons of either sex; the gold medal. The pattern for which the premium is adjudged to remain the property of the Society.

128. For the next in merit; the silver medal, on similar conditions.

129. Copper-plate Patterns for Calico-Printers. For the best pattern, in a new style, fit for the purposes of calico-printers for garment work, or furniture; the silver medal. The pattern for which the premium is adjudged to remain the property of the Society.

N. B. The patterns to be produced on or before the last Tuesday in February, 1810.

130. Manufacture of Sail Cloth. To the person who shall produce to the Society a whole piece of sail cloth, of his own manufacture, proper for the general use of the

royal navy, and at a marketable price; the gold medal.

Certificates of its being manufactured by the person sending it, and a particular Detail of the several circumstances attending its manufacture through the different stages thereof, to be sent to the Society on or before the last Tuesday in March, 1810.

For the next best in merit on similar conditions, the silver medal.

PREMIUMS IN MECHANICS.

131. Gunpowder-Mills. To the person who, in the year 1809, shall invent and bring to perfection the most effectual method of so conducting the works of gunpowder-mills, in the business of making gunpowder, as to prevent explosion; the gold medal, or one hundred guineas.

Certificates and *accounts* of the method having been put in practice in one or more gunpowder-mills in this kingdom, and that it promises, in the opinion of the best judges concerned in such works, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in February, 1810.

N.B. As an encouragement to persons to turn their thoughts to improvements of this nature, if any should be made on the present method of conducting the business of gunpowder making, which fall short of the total prevention of explosion, and they are sent to the Society for the sake of humanity, the papers so sent in will receive due consideration, and such bounty or reward will be bestowed as they may appear to merit.

132. Transit Instrument. To the person who shall invent and produce to the Society a cheap and portable transit-instrument which may easily be converted into a zenith-sector, capable of being accurately and expeditiously adjusted for the purpose of finding the latitudes and longitudes of places, and superior to any portable transit-instrument now in use; the gold medal, or forty guineas.

To be produced on or before the last Tuesday in January, 1810.

133. Taking Whales by the Gun-Harpoon. To the person who, in the year 1809, shall strike the greatest number of whales, not fewer than three, with the gun-harpoon; ten guineas.

Certificates of the striking such whales, and that they were actually taken in the year 1809, signed by the master, or by the mate, when the claim is made by the master, to be produced to the Society on or before the last Tuesday in December, 1809.

134. Family-Mill. To the person who shall invent and produce to the Society the best-constructed mill for grinding corn for the use of private families, or parish-poor; the construction to be such as to render the working of the mill easy and expeditious, and superior to any hitherto in use; the gold medal, or thirty guineas.

The mill, and *certificates* of its having been used to good effect, to be produced to the Society on or before the first Tuesday in February, 1810. Cheapness and simplicity will be considered as essential parts of its merit; and the mill or a model, to remain with the Society.

135. Machine for raising Coals, Ore, &c. &c. To the person who shall invent a machine for raising coals, ore, &c. from mines, superior to any hitherto known or in use; and which shall produce the effect at a less expense than those already known, or in use; the gold medal, or fifty guineas.

A model of the machine, made on a scale of not less than one inch to a foot, with a *certificate* that a machine at large on the same construction has been advantageously used, to be produced to the Society on or before the second Tuesday in February, 1810.

136. Improved Walking-Wheel, or Crane. To the person who shall invent an improved walking-wheel or crane, on which the weight and power of any person or persons shall be applied with the greatest safety and effect, and so contrived that the power can be varied according to the greater or less weight to be raised or lowered; the gold medal, or thirty guineas.

The model, on a scale of not less than one inch to a foot, with a proper *certificate* that the machine at large has been employed to good effect, to be produced to the Society on or before the second Tuesday in February, 1810.

137. Machine for raising Water. To the person who shall invent a machine on a better, cheaper, and more simple construction than any hitherto known or in use for raising water out of wells, &c. from a depth of not less than fifty feet; the gold medal, or thirty guineas.

Certificates of the performance of the machine, and a model of it, on a scale of not less than one inch to a foot, to be produced to the Society on or before the first Tuesday in February, 1810.

138. Elm Pipes. To the person who shall invent and discover to the Society a substitute for the elm pipes now in common use for the conveyance of water, which shall be cheaper, equally effectual, and more durable than any heretofore employed; the gold medal, or thirty guineas.

It is required that one of the pipes so employed, an accurate *account* of the method used, and every expense attending it, together with satisfactory accounts of its being effectual, be delivered to the Society on or before the second Tuesday in January, 1810.

139. Laying Wooden Pipes. To the person who shall invent and discover to the Society a superior method of laying or con-

necting the wooden pipes now in use for conveying water, so as to lessen the injury they receive thereby; the silver medal, or fifteen guineas.

It is required that a model, an accurate *account* of the method used, and every expense attending it, together with satisfactory *certificates* of its being effectual, be delivered to the Society on or before the second Tuesday in January, 1810.

140. Extinguishing Fires. To the person who shall produce to the Society the best and most effectual method of procuring an immediate supply of water in case of fire, or for the means best calculated to prevent or extinguish accidental fires in buildings, superior to any now in use; the gold medal, or thirty guineas.

Certificates of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the second Tuesday in January, 1810.

141. Boring and Blasting Rocks. To the person who shall discover to the Society a more simple, safe, cheap, and expeditious method than any hitherto known or in use, of boring or blasting rocks in mines, shafts, wells, &c.; the gold medal, or thirty guineas.

Certificates of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the first Tuesday in January, 1810.

142. Heating Rooms for the Purpose of Manufacturers. To the person who shall invent and discover to the Society a method of heating rooms, superior to any hitherto known or in use, and at a moderate expense, for the purpose of painters, japanners, and other manufacturers, so as to avoid the necessity of iron or copper tunnels going through the rooms to convey the smoke, whereby the danger from such tunnels may be prevented; the gold medal, or forty guineas.

A model or complete drawing and description of the method, with *certificates* that it has been successfully practised, to be delivered to the Society on or before the last Tuesday in March, 1810.

143. Improved Ventilation. To the person who shall invent and produce to the Society a mode of permanently ventilating the apartments in hospitals, workhouses, and other crowded places, superior to any now known or used; the gold medal, or fifty guineas.

A model of the apparatus, and a full *account* of the means by which the effect has been produced, with proper *certificates*, to be delivered to the Society on or before the last Tuesday in February, 1810.

144. Preventing Accidents from Horses falling with two-wheeled Carriages. To the person who shall invent and produce to the Society a method, superior to any hitherto known or in use, to prevent accidents from the falling of horses with two-wheeled carriages, especially on steep declivities; the silver medal, or fifteen guineas.

A model of the apparatus, and a full *account* of the means by which the effect has been produced, with proper *certificates* that the same has been used with success, to be delivered to the Society on or before the second Tuesday in January, 1810.

145. Improving Turnpike and other Roads. To the person who shall discover to the Society the most effectual and cheapest method, verified by actual experiments, of combining the materials ordinarily employed in making or repairing roads, so as to form them of the hardest consistency by their cementing properties, or by an artificial mixture of earth, stones, &c. altered by heat, or any other mode, so as to form an even, hard, and durable carriage-road; the gold medal, or thirty guineas.

It is required that an accurate *account* of the method used, and every expense attending it, together with satisfactory *certificates* of its being effectual, be delivered to the Society on or before the first Tuesday in March, 1810.

146. Raising the Bodies of Persons who have sunk under Water. To the person who shall invent and produce to the Society a cheap and portable drag, or other machine, superior to those now in use, for the purpose of taking up, in the best and most expeditious manner, and with the least injury, the bodies of persons who have sunk under water; the gold medal, or thirty guineas.

The drag or machine, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in March, 1810.

147. For preventing prejudicial Effects to the Persons employed in Pointing Needles. To the person who shall invent and produce to the Society a mode of obviating the prejudicial effects that attend the operation of pointing needles, by grinding them dry, during which the particles of grindstone, dust, and steel, being thrown into the air, and received with it into the lungs, occasion asthma, consumption, and other painful disorders; the gold medal, or thirty guineas.

A model of the apparatus, and a full *account* of the means by which the effect has been produced, together with proper *certificates* of its practicability and adoption, to be delivered to the Society on or before the second Tuesday in March, 1810.

N. B. *The Society have extended all the Premiums offered in the Class of Mechanics one year further, on similar conditions.*

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE COMMERCE OF THE UNITED EMPIRE.

148. Taking Porpoises. To the people in any boat or vessel, who, in the year 1809, shall take the greatest number of porpoises on the coast of Great Britain or Ireland, by gun, harpoon, or any other method, not fewer than thirty, for the purpose of extracting oil from them; the gold medal, or thirty pounds.

Certificates of the number, signed by the persons to whom they have been sold or delivered for the purpose of extracting the oil, to be produced to the Society on or before the last Tuesday in January, 1810.

149. Oil from Porpoises. To the person who shall manufacture the greatest quantity of oil from porpoises taken on the coast of great Britain or Ireland, in the year 1807, not less than twenty tons; the gold medal, or thirty pounds.

Certificates of the oil having been made from porpoises actually caught on the coast of Great Britain or Ireland, and two gallons of the oil as a sample, to be produced to the Society on or before the last Tuesday in February, 1810.

150. Curing Herrings by the Dutch Method. To the person or persons who shall, before January, 1810, cure the greatest quantity of white herrings, not less than thirty barrels, according to the method practised by the Dutch, and equal in all respects to the best Dutch herrings, the same being caught in the British or Irish seas, and cured in a British or Irish vessel or port; the gold medal, or fifty guineas.

151. For the next greatest quantity, not less than fifteen barrels; the silver medal, or twenty guineas.

A sixteen gallon barrel of the herrings to be produced to the Society on or before the first Tuesday in February, 1810, with *Certificates*, that the conditions of the premium have been fulfilled, and that the whole were cured in the same manner as the specimen, together with a full description of the process employed, in order that the Society may judge how far the Dutch method has been adopted.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE BRITISH COLONIES.

152. Nutmegs. For the greatest quantity of merchantable nutmegs, not less than ten pounds weight, being the growth of his Majesty's dominions in the West Indies, or any of the British settlements on the coast of Africa, or the several islands adjacent thereto, and equal to those imported from the islands of the East Indies; the gold medal, or fifty guineas.

Satisfactory *certificates*, from the governor, or commander in chief, of the place of growth, with an *account* of the number of trees, their age, nearly the quantity of fruit, on each tree, and the manner of culture, to be produced on or before the first Tuesday in December, 1809.

153. Kali for Barilla. To the person who shall have cultivated, in the Bahama Islands, or any other part of his Majesty's dominions in the West Indies, or any of the British settlements on the coast of Africa, or the several islands adjacent thereto, in the year 1808, the greatest quantity of land, not less than two acres with Spanish kali fit for the purpose of making barilla; the gold medal, or thirty guineas.

154. For the next greatest quantity, not less than one acre; the silver medal, or fifteen guineas.

Certificates, signed by the governor or commander in chief for the time being, of the quantity of land so cultivated, and of the state of the plants at the time of signing such *certificates*, to be delivered to the Society, with samples of the kali, on or before the second Tuesday in January, 1810.

159. Destroying the Insect commonly called the Borer. To the person who shall discover to the Society an effectual method of destroying the insect commonly called the Borer, which has of late years been so destructive to the sugar-canes in the West-India islands, the British settlements on the coast of Africa, and the several islands adjacent thereto; the gold medal, or fifty guineas.

The discovery to be ascertained by satisfactory *certificates*, under the hand and seal of the governor or commander in chief for the time being, and of some other respectable persons, inhabitants of the islands, or other place, in which the remedy has been successfully applied; such *certificates* to be delivered to the Society on or before the first Tuesday in January, 1810.

156. Cultivation of Hemp in Upper or Lower Canada. To the person who shall sow with hemp, the greatest quantity of land in the province of Upper Canada, not less than six arpents, (each four-fifths of a statute acre) in the year 1809, and shall at the proper season cause to be plucked the summer hemp, or male hemp bearing no seed, and continue the winter hemp, or female hemp bearing seed, on the ground until the seed is ripe; the gold medal, or one hundred dollars.

157. To the person who shall sow with hemp the next greatest quantity of land in the same province of Upper Canada, not less than five arpents in the year 1809, in the manner above mentioned; the silver medal, or eighty dollars.

158. For the next greatest quantity of land, in the same province, and in a simi-

lar manner, not less than four arpents; sixty dollars.

159. For the next greatest quantity of land in the same province, and in a similar manner, not less than three arpents; forty dollars.

160. For the next greatest quantity of land, in the same province, and in the same manner, not less than one arpent; twenty dollars.

Certificates of the number of arpents, the method of culture, of the plucking of the hemp, with a general *account* whether sown broad-cast or in drills, the expense, soil, cultivation, and produce, to be transmitted to the Society, certified under the hand and seal of the governor or lieutenant-governor, together with 28lb. of the hemp, and two quarts of the seed, on or before the last Tuesday in November, 1810.

161 to 165. Premiums exactly similar in all respects to those held out for the province of Upper Canada, are also offered for the province of Lower Canada, and are extended to the same period.

166. Importation of Hemp from Canada. To the master of that vessel which shall bring to this country the greatest quantity of marketable hemp, net less than one hundred tons, in the year 1809, the produce of Upper or Lower Canada; the gold medal.

167. To the master of that vessel which shall bring the next quantity, not less than fifty tons; the silver medal.

Certificates satisfactory to the Society, to be produced by the master of the vessel on or before the first Tuesday in February, 1810, to testify that such hemp was grown and prepared in Canada.

168. Substitute for Hemp. To the person who, in the year 1809, shall discover and produce to the Society, a substitute for hemp, equally cheap, durable, and applicable to all the purposes for which hemp is now used; the gold medal, or fifty guineas.

A quantity of the substitute, not less than one hundred weight, together with proper *certificates* from the governor or commander in chief, if raised in any of the British colonies, or from the Secretary of the Board of Trade, if raised in the East Indies, to prove that the same has been used with success, to be produced to the Society on or before the last Tuesday in February, 1810.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE BRITISH SETTLEMENTS IN THE EAST INDIES.

169. Bhaugulpore Cotton. To the person who shall import into the port of London, in the year 1809, the greatest quantity, not less than one ton, of the Bhaugulpore cotton, from which cloths are made in imitation of nankeen, without dying; the gold medal.

A quantity of the cotton not less than five pounds weight, in the pod, and five pounds carded, to be produced to the Society, with proper *certificates*, signed by the Secretary to the Board of Trade of Bengal or Bombay, on or before the last Tuesday in February, 1810.

170. Annatto. To the person who, in the year 1809, shall import into the port of London, from any part of the British settlements in the East Indies, the greatest quantity of annatto, not less than five hundred weight; the gold medal.

A quantity of the annatto, not less than ten pounds weight, to be produced to the Society, with proper *certificates*, signed by the Secretary of the Board of Trade of the respective settlement, that the annatto is the produce of such settlement, on or before the last Tuesday in February, 1810.

171. True Cochineal. To the person who, in the year 1809, shall import into the port of London, from any part of the British settlements in the East Indies, the greatest quantity of true cochineal, not less than five hundred weight; the gold medal.

A quantity of the cochineal, not less than ten pounds weight, with proper *certificates*, signed by the Secretary of the Board of Trade of the respective setttlement, that the cochineal is the produce of such settlement, to be produced to the Society on or before the first Tuesday in February, 1810.

N. B. The premiums from No. 148 *to* 171, *inclusive, are all extended three years further on similar conditions. Certificates to be produced at the same time of the years ensuing.*

GENERAL CONDITIONS.

As the great object of the Society in rewarding individuals is to draw forth and give currency to those inventions and improvements, which are likely to benefit the public at large, candidates are requested to observe, that if the *means*, by which the respective objects are effected, do require an expense or trouble too great for *general purposes*, the Society will not consider itself as bound to give the offered *reward;* but, though it thus reserves the power of giving in all cases such part only of any premium as the performance shall be adjudged to deserve, or of withholding the whole if there be no merit, yet the candidates may be assured the Society will always judge liberally of their several claims,

All candidates are to take notice, that no claim for a premium will be attended to, unless the conditions of the advertisement are fully complied with.

All models of machines, which obtain premiums or bounties, shall be the property of the Society; and, where a premium or bounty is given for any machine, a perfect model and description thereof shall be given to the Society.

All the premiums of this Society are designed for Great Britain and Ireland, unless expressly mentioned to the contrary.

The claims shall be determined as soon as possible after the delivery of the specimens.

It is expected that all articles for claims or bounties be sent to the Society, carriage paid.

No person shall receive any premium, bounty, or encouragement, from the Society, for any matter for which he has obtained, or purposes to obtain, a patent, or for which he has obtained, or expects any premium or reward from any other Society.

A candidate for a premium, or a person applying for a bounty, being detected in any disingenuous method to impose on the Society, shall forfeit such bounty, and be deemed incapable of obtaining any for the future.

No member of this Society shall be a candidate for, or entitled to receive, any premium, bounty, or reward whatsoever, except the honorary medal of the Society. The candidates are, in all cases, expected to furnish a particular account of the subject of their claims; and where certificates are required to be produced in claim of premiums, they should be expresed, as nearly as possible, in the words of the respective advertisements, and be signed by persons who have a positive knowledge of the facts stated.

Where premiums or bounties are obtained in consequence of specimens produced, the Society mean to retain such part of those specimens as they may judge necessary, making a reasonable allowance for the same.

No candidate, not a member, shall be present at any meetings of the Society or committees, or admitted at the Society's rooms, after they have delivered in their claims, until such claims are adjudged, unless summoned by the Committee.

The Society, anxious to promote the Arts of their country, have adopted the resolution of forming a Collection of Prints, to be open for public inspection; and, having arranged those already in their possession, invite engravers to send etched or finished proofs of their plates: and hope that amateurs, collectors, and publishers of works of art, will also contribute to the undertaking.

Prints of machines, or maps, will also come within the above arrangement.

The Society farther invite the communications of scientific and practical men, upon all subjects connected with the views of the Society, although their experiments may have been conducted upon a smaller scale than the terms required by the premiums; as such communications may afford ground for more extensive application, and thus materially contribute to the advantage of the public.

The Library of the Society, which has already become very valuable, may yet receive considerable additions and improvements from the presents of members, or other persons who may be inclined to place useful books or valuable manuscripts in a repository, at once permanent and conducive to the national benefit.

All communications are to be made by letter, addressed to CHARLES TAYLOR, M. D. the Secretary, *at the Society of Arts, &c. Adelphi, London.*

And where articles are sent by Sea for the Society, the Bills of Lading are to be addressed to the care of WILLIAM VAUGHAN, Esq. *Mincing-lane, London,* who has politely undertaken to receive them for the Society.

The Winchester bushel is the measure referred to for grain; and, as the acres of different districts vary in extent, it is necessary to observe, that the Society mean Statute Acres of five and a half yards to the rod or pole, when acres are mentioned in their list of premiums; and they request that all communications to them may be made agreeably thereto.

The Society desire that the Papers on different subjects sent to them may be full, clear, explicit, fit for publication, and rather in the form of Essays than of Letters; and that descriptive Drawings may be sent, with the Models and Machines laid before the Society.

*** To persons inclined to leave a sum of money to this Society by will, the following form is offered for that purpose.

Item. I give and bequeath to A. B. and C. D. the sum of upon condition and to the intent that they, or one of them, do pay the same to the Collector, for the time being, of a Society in London, who now call themselves the Society for the Encouragement of Arts, Manufactures, and Commerce; which said sum of I will and desire may be paid out of my personal estate, and applied towards the carrying on the laudable designs of the Society.

N. B. The Society considering that it would be beneficial to the Commerce of the United Kingdom to bring the British Marbles into more general use, and that the most effectual method of accomplishing their object would be, for the present, *to make them more generally known in the capital, have come to the following resolutions:—*

Resolved,—That specimens of British Marbles be exposed in the Society's Rooms, at the Adelphi, for the inspection of the public, under the following regulations:

1st, That all the specimens be exact to a given size, *viz.* eight inches high, six inches broad, one inch thick, and polished on one face.

2d, That a book be kept, containing the number of each specimen, and describing the situation of the quarry, the name of the parish where situated, the distance of the quarry from a beaten road, and the distance of that road from water-carriage, with the name of the donor and proprietor. Any remarks on the qualities of the marbles, or on the lime produced from them, will be gratefully received and preserved by the Society, as materials for future inquiries.

Resolved,—That as the exertions of the Society can be beneficial to the public, only inasmuch as their views are seconded by the public, the Society request, that all persons, proprietors of marble quarries, will favour them with a specimen of the marble, worked to the exact size above mentioned, with the description of the quarry as above, that the same may be entered in the book to be preserved for the use of the public. By such arrangements, it is expected that the interest of the proprietors of the quarries will be promoted, and the use of British marble much extended. A variety are already exhibited in the Society's Great Room.

Premiums and Rewards bestowed in May, 1809, by the Society of Arts, Manufactures, and Commerce, Adelphi.

ON Tuesday the 30th of May, 1809, the Rewards of the Society were, as usual, distributed by his Grace the Duke of Norfolk, arranged under the following classes; and on Wednesday, the 7th of June, the Society held the last Meeting of that Session, and adjourned to the fourth Wednesday in October next.

IN AGRICULTURE.

To John Christian Curwen, Esq. M. P. of Workington Hall, Cumberland, for planting in one year, 1,269,000 larches and other forest trees, the gold medal.

To W. M. Thackeray, M. D. of Chester, for extensive plantations of ash, beech, chesnut, elm, and other forest trees, the gold medal.

To William Congreve, Esq. of Aldermaston-house in Berkshire, for planting 74 acres of land with acorns and oaks, the gold medal.

To Mr. William Salisbury, Botanic-garden, Brompton, for raising grass seeds and preparing meadow-land, the silver medal.

To Charles Le Hardy, Esq. Isle of Jersey, for communications on the culture of parsnips, and their utility in feeding cattle, the silver medal.

To the Rev. James Hall, of Chesnut-walk, Walthamstow, for preparing from bean stalks a substitute for hemp, the silver medal.

To Mr. William Lester, of Paddington-green, for a machine for washing potatoes and other esculent roots for feeding cattle, the silver medal.

To Mr. William Salisbury, Botanic-garden, Brompton, for a method of packing plants and trees, intended for exportation, so as to preserve their vegetative powers for many months, twenty guineas.

IN CHYMISTRY.

To Mr. J. P. Hubbard, Picket-street, Temple-bar, for a beautiful variety of specimens of British marble, principally from the Babicomb quarry near Teignmouth in Devonshire, the gold medal.

To Mr. R. Porrett, jun. of the tower, for experiments and observations on prussic and prussous acids, the silver medal.

IN POLITE ARTS.

To Miss Millicent Montgomery, granddaughter of Viscount Gosford, of the kingdom of Ireland, for a drawing of the head of Achilles from a plaster cast, the silver medal.

To Miss Eliza F. Batty, of Charlotte-street, Portland-place, for an original drawing of a landscape near Buttermere Lake, the gold medal.

To Mr. L. Clennell, of Constitution-row, Gray's Inn Lane, for an engraving in wood of the Highland Society's diploma, the gold medal.

To Mr. Philip Hardwick, of Berner's-street, for an original drawing of an academy of arts, *being the premium given in conformity to the will of the late John Stock, Esq. of Hampstead*, the gold medallion.

To Miss H. A. E. Jackson, of Hanover-street, for an original painting of Venus and Cupids, the silver medal set in gold.

To Miss Busby, of St. Anne's-street West, for a painting of St. Catharine, a copy, the silver medal set in gold.

To Miss Mary Okes, of Cambridge, for a drawing of Gloucester cathedral, the smaller silver pallet.

To Mr. Robert Baugh, of Llanymynech, in Shropshire, for a map of that county, the silver medal and fifteen guineas.

To Mr. W. Woolnoth, Gloucester-place,

Camden-town, for a line engraving of a method of relieving persons on board stranded ships, the silver medal.

To Mr. Edward Blore, of Upper Titchfield-street, for an original drawing of Fotheringham church, Northamptonshire, the silver medal.

To Miss H. Hopwood, of Latham's-place, Somer's-town, for a drawing from Mr. Sharp's print of the holy family, the silver medal.

To Miss Ann Medland, of the Parsonage, Hertford, for a drawing in colours of the head of an old man, a copy, the larger silver pallet.

To Mr. David Smith, Acton-street, Gray's Inn Road, for a drawing from a print of love and honour, the larger silver pallet.

To Mr. J. C. Bromley, of Brook-green, Hammersmith, for an etching of a landscape, figures, and cattle, a copy, the larger silver pallet.

To Master William Ross, of Tavistock-street, for an original miniature painting of Venus and Cupid, the larger silver pallet.

To Miss Charlotte Smith, Bridge-row, Pimlico, for a plaster cast of Bacchus, the larger silver pallet.

To Miss Mary Cooke, of Upper Pratt-place, Camden-town, for an engraving of the moon, the larger silver pallet.

To Miss Sarah Brown, of Handsworth, in Staffordshire, for modelling in wax, the smaller silver pallet.

To Master Joseph Farey, Upper Crown-street, Westminster, for an original drawing of a steam engine, the smaller silver pallet.

IN MANUFACTURES.

To the Patrons and Committee of the Flag Association, for a matchless specimen of double brocade-weaving in a flag now executing in Spital-fields, the silver medal set in a broad gold border.

To Mr. William Saddington, Monkwell-street, Falcon-square, for a method of manufacturing silk covered wire, and thread covered with silk, thirty guineas.

IN MECHANICS.

To John Miller, Esq. of Bedford, for his methods of raising the bodies of persons who have sunk under water, the gold medal.

To Captain William Bolton, R. N. for naval improvements, the gold medal.

To Captain Keith Maxwell, R. N. for improving telegraphic signals, the gold medal.

To Mr. George Williams, of his Majesty's dock-yard, for securing the beams of ships, without wooden knees made of a single piece, the silver medal.

To Lieutenant James Spratt, R. N. for a homograph, or a mode of communication at a distance by particular positions of a handkerchief, the silver medal.

To Mr. Knight Spencer, of Bow, for an anthropo telegraph, or mode of communication in the day or night, by disks, the silver medal.

To Matthew Murray, Esq. of Leeds, for a machine for hackling hemp or flax, the gold medal.

To Mr. Robert Salmon, Woburn, for a method of preventing depredations in gardens and orchards, the silver medal.

To Richard White, Esq. of Essex-street, Strand, for an ingenious letter-file, the silver medal.

To Mr. Samuel Clegg, of Manchester, for an improved apparatus for extracting carbonated hydrogen gas from pit coal, the silver medal.

To Mr. George Prior, jun. of Otley, Yorkshire, for a clock escapement, the silver medal and twenty-five guineas.

To Mr. J. Varty, of Liverpool, for a method of preventing the accidents which frequently happen from the lynch pins of carriages breaking or coming out, the silver medal.

To Mr. J. D. Ross, of No. 53, Greek-street, Soho, for an eye bath to clear the eye from extraneous matters, and to assist the sight, fifteen guineas.

To Mr. Tho. Warren, jun. of Bury St. Edmunds, for teaching to write on a cheap plan by means of copies engraved on slates, the silver medal and ten guineas.

To Mr. J. Brockbank, of Whirlpipin, Whitehaven, for an ingenious machine for making slate pencils, fifteen guineas.

To Mr. Thomas Newton, of Bridge-street, Black-friar's, for a machine for cutting roots for cattle, or articles for dyers, or for culinary uses, fifteen guineas.

To Mr. Robert Salmon, of Woburn, for a method of constructing commodious houses with earthen walls, twenty guineas.

COLONIES AND TRADE.

To Mr. C. F. Grece, of Montreal, Lower Canada, for the culture and preparation of hemp in Canada, the silver medal set in a broad gold border.

The number of Members elected since October, 1808, *is* 103.

The List of Premiums offered may be had, *gratis*, at the Society's House in the Adelphi;

By Order of the Society,

June, 1809. CHARLES TAYLOR, M. D. Secretary.

R. WILKS, Printer, 89, Chancery-lane.

PAPERS

IN

AGRICULTURE.

The GOLD MEDAL *of the Society, being the Premium offered for Planting Larches, was this Session adjudged to* JOHN CHRISTIAN CURWEN, *Esq.* M. P. *of Workington Hall, Cumberland, from whom the following Communications were received.*

DEAR SIR,

I PRESUME once more to offer myself a Candidate for the Society's Premium for Planting.

The complete success of my former plantations on the banks of Windermere, determined me to appropriate to a similar purpose, a tract of four hundred acres of mountain land, in the same neighbourhood.

From experience I feel myself justified in stating, that no speculation holds out a more flattering prospect, than making plantations on many indifferent mountain pasture lands. The plot I now claim for, though surrounded with a wall six feet high, would not have let as a sheep pasture, for two shillings and six-pence per acre. I feel confident, that I

greatly underrate the value of the wood at sixty years growth, when I estimate it at fifteen shillings per acre, with compound interest, or two hundred and sixty two pounds per acre. At this moment I believe an acre of Scotch fir, the least valuable of forest wood, to be at sixty years growth wherever there is a market, three hundred pounds per acre; and I do not take into the account the produce of thinnings, which after thirty years must be of considerable value. I think larch might be estimated as worth one pound per acre, with compound interest, or three hundred and fifty pounds. I have given a decided preference to larch trees, as out of one million two hundred and sixty-nine thousand trees in the present statement, above one half are larch, as I conceive larch trees to be best suited for high and exposed situations.

In every instance, each species of trees is planted separately; I believe this will be found advantageous in all situations, but admits of no doubt when wood is exposed. I have reduced my number to three thousand per acre, as the thinnings in such situations will not pay the labour. The fears I entertained for the larch from the distemper with which a few years ago they were attacked, in various parts of Scotland and Northumberland, have subsided. I observed a plantation this season in Northumberland, which had been a great sufferer, but was now beginning to make fresh wood. As an encouragement for planting larches, I beg leave to state that I have trees at Windermere of twenty-four years growth, which contain twenty-five feet of timber; this is however to be understood of favoured spots, but in all dry situations, the larch gives the most flattering prospect of making ample returns of profit.

Inclosed are Certificates from the nurserymen who furnished, and the person whose duty it was to count and examine,

amine, the trees, likewise others from the Rectors of Hawkshead and Workington.

This is the greatest exertion I have made in planting, and I must in candour and fairness attribute it to Mr. Johnes of Hafod's declaration to the Society of his intention to plant an annual million; this stimulated me to attempt it, and I have fortunately succeeded. Though I hope to continue to the latest period of my life a planter, I do not conceive it likely that I shall ever be in a situation to make so extensive a claim again for the honours of the Society. I beg leave to make my acknowledgements to them, for the favors they have already bestowed upon me. The pleasure and satisfaction they have afforded me, have abundantly repaid my exertions; the benefit will be to the public, and those who succeed me; the merit of having promoted the object, will ever remain due to the Society, whose honorable rewards will I trust to the latest period, be held in the same estimation by others, as they are by,

Dear Sir,

Your obedient humble Servant,

J. C. CURWEN.

Workington Hall, Dec. 24, 1808.

To C. Taylor, M.D. Sec.

Certificates were received from John Saunders, and Caleb Atkinson, nurserymen, stating, that having contracted with J. C. Curwen, Esq. to plant for him with forest trees, upwards of four hundred acres of land, on Clar common, his property, after the rate of three thousand trees per acre, they had actually planted for him there, between the first of October 1805, and the last day of April 1806, above

one million two hundred and eight thousand trees of the following kinds; viz. upwards of 530,000 larches, 200,000 Scotch firs, 336,000 ashes, 70,000 oaks, 30,000 elms, 24,000 beeches, and 18,000 alders.

These certificates were further confirmed by ROBERT RAVEN, Agent to J. C. Curwen, Esq. who counted the trees planted by Messrs. SAUNDERS and ATKINSON.

Certificates were also received from ROBERT PORTER, WILLIAM TURNBULL, and JOHN GREENER, testifying to further plantations made by J. C. Curwen, Esq. within the above period, containing 19,000 oaks, 70,300 larches, 2,100 birch, 4,000 beech, 100 poplars, and 600 Scotch firs.

A Certificate from the Rev. REGD. BRATHWAITE, minister of Hawkshead, dated July 27, 1808, stated that he had on that day viewed the Heald plantation, the property of J. C. Curwen, Esq. consisting of four hundred acres of land or upwards; that it is surrounded with a stone wall, which is in general six feet high, and the trees completely secured from depredation; that the wood is in general very thriving, particularly so where the heath hath been burnt previous to planting. That he also saw the flourishing condition of all the plantations which surrounded the Heald, and that he has no doubt of its being in a very few years, a most thriving and valuable plot of wood.

A Certificate from the Rev. PETER HOW, Rector of Workington, dated Feb. 4, 1809, stated, that he had viewed the plantations of J. C. Curwen, Esq. at Workington, and found those parts which had been replanted with young trees, in a flourishing condition, and the whole well fenced. That the general thriving state of these plantations, considering their elevated situation and exposure to the sea, has greatly surpassed the most sanguine expectation.

The

The GOLD MEDAL *of the Society was this Session voted to* W. M. THACKERAY, M. D. *of Chester, for extensive Plantations made by him of Ash, Chesnut, Elm, and other Forest Trees. The following Communications were received from him.*

SIR,

SEVERAL persons interested in the cause of planting and agricultural improvements, having thought that I ought to transmit to the Society of Arts, &c. an account of the plantations I have made in the counties of Denbigh and Merioneth, from Nov. 1804, to May 1808, on the estates of my ward and stepson (now a minor), John Maurice Jones, Esq. I have been induced to draw out a plain statement of them, which I request you will please to lay before the Society.

Not having particularly attended to their rules and regulations, I know not whether I shall be entitled to any honorary reward for my exertions, I submit them however to their consideration, and beg leave to add, that it is my intention to inclose and plant for the next four years during my stepson's minority, thirty acres annually of land which is at present unproductive, being fully convinced that I cannot in any other way prove myself so useful or faithful a guardian to him as by so doing, and I hope that the benefit accruing from such conduct will eventually prove advantageous to the country at large.

In the statement for the different years, I have confined my return to the number of trees in the regular plantations, though I have also filled the hedge-rows of the estate with many thousand trees, and have dibbled at the time of planting through the different plantations more than thirty bushels of

acorns, which grow uncommonly well. I need scarcely to add, that I have taken every care to preserve them from the trespasses of sheep, cattle, and idlers, by the best kind of defence, viz. walls six feet high, or quickset fences. The whole of the plantations are more than one hundred and seventy acres, and the land mountainous, declivities of hills, or dingles incapable of being improved by the plough. Part of the land is of a thin moory or boggy nature upon Ramel, and part nut-brown soil of a middling depth. In other places the soil is brown, thin, and intermixed with rocks. Every tree injured or destroyed has been carefully replaced.

My nurseries at Dolfriog, Bwlchy Park, and in Chester, contain many thousand forest trees of various kinds, from one to four years old, including near four thousand American oaks.

Since I have begun my agricultural pursuits, I have expended upwards of three thousand pounds, in draining, irrigating, and otherwise improving the before-mentioned estates, which improvements I purpose on some future occasion to lay before the Society.

I have the honour to be, Sir,

Your obedient humble servant,

W. M. THACKERAY, M. D.

Chester, Sept. 25, 1808.

To C. Taylor, M. D. Sec.

Account

Account of the number of Acres inclosed and planted, and of the quantity and kind of Trees planted, by W. M. Thackeray, M. D. Guardian to John Maurice Jones, Esq. a Minor, in the Counties of Denbigh and Merioneh.

From November 1804, to May 1805.

Denbighshire.	A.	R.	P.
On the lands of Bwlchy Park	1	1	12
Of Gallygunnan -	21	0	38
Merionethshire.			
Of Cwm Caith -	10	0	28
Of Cyfty -	7	3	3
Of Dolfriog -	6	2	6
	47	0	27

Ash - -	6,634
Do. Mountain -	50
Beech -	18,400
Birch - -	50
Spanish Chesnut -	260
Horse Chesnut -	1,260
Elm - -	3,600
Fruit - -	60
Larch - -	59,220
Oak - -	62,600
Poplar - -	3,300
Quicksets -	27,100
Scotch fir -	4,100
Sycamore -	7,226
Willow - -	1,800
Within - -	200
	195,897

From November 1805, to May 1806.

Denbighshire.	A.	R.	P.
On the lands of Bwlchy Park	0	2	29
Of Brinelle -	9	0	2
Merionethshire.			
On the lands of Cwm Caith and Dolfriog -	9	0	0
	18	2	31

Ash - -	8,500
Beech -	29,700
Horse Chesnut -	1,500
Elm - -	1,000
Gilead fir - -	240
Larch -	33,000
Oak - -	32,000
* Black Italian Poplar	21,700
White Poplar -	9,800
Balsam Poplar -	250
Quicksets -	64,000
Scotch fir -	17,500
Spruce fir -	9,500
Sycamore - -	5,250
Willow - -	1,800
	235,740

* N. B. At Pryddlewell we found in Sept. 1st, 1808, a black Italian poplar, which had been planted in February 1805, when only one inch in girth, a foot from the ground, and six feet high, which now measured twelve inches in girth, and was more than sixteen feet in length.

From November 1806, to May 1807.

Denbighshire.	A.	R.	P.
On the lands of Craighlelo	15	1	10
Of Cuffnant	1	2	16
Merionethshire.			
On the lands of Cwm Caith	40	0	0
Of Gellyrin	7	0	0
Of Cyfty	3	2	0
Of Penylan	1	2	0
Of Cae Glass	0	1	0
			69,026

Ash	48,213
Mountain Ash	1,000
Beech	51,983
Birch	1,000
Horse Chesnut	1,992
Spanish Chesnut	371
Elm	1,000
Fruit	54
Larch	119,045
Oak	16,356
Black Italian Poplar	800
Do. cuttings	11,000
Athenian Poplar	37
Quicksets	26,000
Scotch fir	21,380
Spruce fir	2,000
Sycamore	13,333
Willow	4,000
Golden Willow	200
	319,769

From November 1807, to May 1808.

Denbighshire.	A.	P.	P.
On the lands of Gallygunnen	36	0	0

Many thousand trees have been planted in the Forest, on a part of a Farm called Bryncaredig.

Alders	120
Ash	75,575
Beech	36,786
Horse Chesnut	100
Spanish Chesnut	6,300
Elm	2,600
Do. Grafted	200
Larch	171,390
Oak	38,632
Poplar	328
Black Italian	600
Quicksets	21,300
Scotch fir	18,320
Silver fir	258
Spruce fir	3,000
Sycamore	6,596
Willows	362
	382,467

A Certificate

A Certificate from THOMAS JONES, dated Sept. 30, 1808, stated, that by order of Dr. Thackeray he planted and sowed with acorns the lands of Cwm Cath, Dolfriog, and Gellyrin, in the parish of Bethgelert, in the county of Merioneth; and that he believes the land which he planted and sowed with acorns, were more than seventy-two acres; that the land is fairly and properly fenced with a good wall six feet high; and that he supposes a fair proportion of the trees above-mentioned were set in the land when he was employed as planter.

A Certificate from THOMAS ROBERTS, dated Sept. 27, 1808, testified, that by order of Dr. Thackeray he did plant and sow with acorns the lands of Gallygunnan, Bwlchy Park, and Cuffnant, in the parish of Llanarnon, in the county of Denbigh; of Craighlelo, in the parish of Gwddelaer, and of Cyfty, in the parish of Llanceil, in the county of Merioneth; and that he believes that the lands which he planted and sowed did contain more than ninety-six acres; that the said land is properly fenced with a good wall or quicksets, and posts and rails; and that he supposes a fair proportion of the number of trees above-mentioned were set in the lands where he was employed as planter.

Certificates from THOMAS HUGHES, of Plasnewydd, and W. WILLIAMS, of Garreglwyd, dated Sept. 27, 1808, stated, that they had examined the plantations described by Dr. Thackeray, and believe his statement to be correct; that the whole land is fairly planted and sown with acorns; that the trees are in good health and a thriving state; and that they are secured from trespass and external injury by sufficient fences.

The

The GOLD MEDAL *of the Society, being the Premium offered for planting Oaks, was this Session adjudged to* WILLIAM CONGREVE, *Esq. of Aldermaston-House, in Berkshire, from whom the following Communications were received.*

SIR,

I REQUEST you will have the goodness to lay before the Society of Arts, &c. the following account of plantations of acorns made by me. Although not quite half the quantity of land was planted with acorns precisely at the time required in the list of their Premiums, I trust the Society will not, from that circumstance, consider this communication as undeserving of their notice, as I observe that the Society are desirous of encouraging improvements of all kinds, though they are not particularized in their list of premiums offered.

Permit me now to state the following account of my plantations.

No. 1. Upwards of twelve acres of a piece of land called the Arbor Hill, in Aldermaston Park, I planted with acorns in February, 1802. Many of the plants are now from six to eight feet high, and very healthy; they were injured by rabbits when young, or would have been considerably higher.

No. 2. Three acres of adjoining land, I planted in February 1806; the oak plants are now from a foot to eighteen inches high, and very healthy.

No. 3. A part of Upton Common, in the parish of Alston, inclosed by act of parliament in 1805, I planted with acorns in

in February 1806; this piece of land is about eleven and a half acres, and the plants are now about a foot high.

No. 4. I planted in February 1807, one acre and three quarters of the same common, joining the parish of Sulhamstead. The oak plants are about a foot high.

No. 5. In February 1807, I planted about three acres of an inclosed piece of land called Lady Wood, in the parish of Aldermaston. These plants are about a foot high.

No. 6. In February 1807, I planted about twenty acres of inclosed land on the side of a rising ground called Mareridge Hill, in the parish of Ufton. The plants are now about a foot high.

No. 7. In February 1807, I planted two acres and a quarter of inclosed land in Aldermaston Park, called the Shaw Close. The plants are now about a foot high.

No. 8. In February 1807, I planted several small pieces of land in Aldermaston Park, containing upwards of three acres. The plants are now about a foot high.

No. 9. In February 1808, I planted four and a half acres of an inclosed piece of land called the Furze Ground, adjoining Aldermaston Heath. The plants are now about six inches high.

No. 10. In February 1808, I planted a piece of land containing eleven acres, formerly divided into four small inclosures, in the parish of Aldermaston. The plants are about six inches high.

No. 11. In February 1808, I planted two and a quarter acres of a piece of inclosed land, in the parish of Aldermaston, called Wicken's Piddle. The plants are now about six inches high.

The

The whole of the plants are well fenced, and there are many more than three hundred plants upon every acre of ground. In all the plantations the acorns were set by women and children with sticks used in bean setting, and about two inches deep, in rows a yard asunder, and a foot between each acorn.

Excepting in No. 1, the land was not prepared in any way whatever. Where there was furze and heath, the furze was cut as close as possible, but the heath was left as a shelter to the young plants. I conceive that very young trees of all kinds are more injured by being exposed to a hot sun, than by any other cause whatever, and that heath or long grass is a great protection to them.

In No. 1. the land had been ploughed two or three times, and about a month after the acorns were set, it was sown with furze seed, broadcast, and harrowed. The furze has grown very luxuriant, and has, in some places, been twice cut for bavins for burning bricks; and it has, I think, been of service in affording shelter to the plants when young, but owing to the difficulty of destroying rabbits in strong furze, they have increased so much as to injure the young plants very materially in some parts of the plantation. They are now, however, so high, that they will probably destroy the furze entirely in two or three years. In the other plantations birch has been planted amongst the acorns.

The land is, in general, a mixture of gravel and clay, and in a few places almost entirely clay. About eighteen acres are heath land, totally uncultivated and unproductive; the remainder arable, of a very inferior quality, and some of it so bad and uneven as not to have been thought worth cultivating for some years past by the farmer who rented it. The number of acres planted in February 1807, were thirty.

Forty-

Forty-four acres were planted before and since, making in the whole seventy-four acres planted with acorns.

I have the honour to be, Sir,

Your most obedient humble servant,

WILLIAM CONGREVE.

Aldermaston-House, Dec. 3, 1808.

To C. TAYLOR, M. D. SEC.

Certificates were received from the Rev. G. H. DEANE, Minister of the parish of Aldermaston, and WILLIAM STEPHENS, and WILLIAM HICKMAN, inhabitants of the same parish, dated Dec. 3, 1808, stating that they had inspected the plantations above described, and that the statement concerning them is in every respect accurate.

SIR,

I WAS favoured with your letter yesterday, and am sorry that my having neglected to attend to the rules laid down by the Society has occasioned you the trouble of writing again upon the subject of my plantations. I was very much hurried at the time the statement was drawn up, and was not aware, till I received your letter, that I had omitted noticing the present thriving condition of the plants. I have lately had an opportunity of examining the plantations more accurately, and find that in some of them, where the plants were described as being one foot high, they are in fact nearer three feet, and are in general in the most thriving state possible. Mr. Deane, the clergyman of this parish, who signed the former certificate, is at present from home, and not likely

to

to return for some time; but two signatures of the present state of the plants will probably be considered as sufficient.

I have the honour to be, Sir,

Your most obedient servant,

WILLIAM CONGREVE.

March 13, 1809.

To C. TAYLOR, M. D. SEC.

Certificates from WILLIAM STEPHENS and WILLIAM HICKMAN, of the parish of Aldermaston, testified, that on the 13th March, 1809, the oak plants in all the plantations belonging to William Congreve, Esq. in the parishes of Aldermaston and Ufton, referred to by them on the 3d December, 1808, are now in a healthy and thriving state, and are all well fenced.

The SILVER MEDAL *of the Society was this Session voted to Mr.* WILLIAM LESTER, *of Paddington, for a Machine for Washing Potatoes and other esculent Roots for feeding Cattle. The following Communication was received from him, and a Model of the Machine is preserved in the Society's Repository.*

SIR,

HEREWITH you will receive a machine for the more expeditious washing of all tuberous rooted vegetables (such as potatoes, turnips, carrots, &c.) from the soil that adheres to them when taken from the ground.

The

The staved cylinder revolving in a trough of water so slow as not to excite the centrifugal force, is not new. I have made use of it myself twelve years ago, but always found it cold and wet work to take the roots from it when washed. To obviate which, I have added the levers and wheels, and find it a very great improvement, as a boy therewith can do the work of two men, without exposing himself to the dangerous effects of dabbling in cold water. The importance of this mode will appear very obvious, when compared with the present laborious one used by the potatoe sellers in London. The partial motion given to the potatoes by stirring them about in a tub, cannot separate the soil so effectually from them, as when the water is more violently agitated by their falling over each other in a revolving cylinder, neither will they be so much bruised as by the ends of the levers. If the soil should be particularly adhesive, the heads of a couple of old hearth or birch brooms put into the cylinder will effectually disengage it from the eyes of the potatoes, and as the dirt separates, it falls to the bottom of the water in the vessel under the cylinder.

If you will have the goodness to lay this before the Society, and it should be deemed worthy of their attention, I will, if necessary, on being requested, attend to explain the effects of the machine.

I am, Sir,

Your most humble

and obedient servant,

W. LESTER.

Paddington-Green, Nov. 24, 1807.

To C. Taylor, M. D. Sec.

SIR,

SIR,

On my return from the west of England yesterday morning, I found your letter; I therefore had not time to procure any Certificates from the country by this day's post.

I have sold root washers to the following gentlemen, viz. Lord Northampton, at Castle-Ashby, Northamptonshire; Mr. Ludlow, Cheshunt, Herts; Mr. Clerk, New Park, Hadlow, Kent; and several others, all of which have been approved of.

I have no intention to apply for a patent for it, as it has been at work in different parts of the country for more than six months.

If the Society will do me the honour of conferring their Medal on me, I will send them a model, and conform most strictly to their rules.

I am, Sir,

Your most obedient

humble servant,

W. LESTER.

Paddington-Green, May 18, 1808.

To C. Taylor, M. D. Sec.

SIR,

Agreeable to your request I have procured the enclosed Certificates, &c. on the utility of my improved root washer, which you will have the goodness to lay before the Society.

I have no doubt but it would save half the labour in washing potatoes in London, if it were brought into use: It is obvious to every one who has seen it work, that it is greatly

superior

superior to the tub and levers used by the potatoe-merchants, as it is not so liable to injure the roots. The soil is drawn from them with more facility, and their falling into the basket from the cylinder is more clean and commodious by far than taking them out of the tub with a grated shovel, from the corners of which many roots are bruised; it also prevents the potatoes being injured in quality from being long soaked in water, from which they suffer greatly in the common way.

I am, Sir,
Your most obedient
and humble servant,
W. LESTER.

Paddington-Green, May 8, 1809.

To C. TAYLOR, M. D. SEC.

Certificates of the Utility of Mr. Lester's Machine for Washing Tuberous Roots.

SIR,

IN reply to your enquiries respecting the utility of the root-washer, which I purchased of you about twelve months since, I have much satisfaction in stating, that I have used it, constantly, during the last winter, and have found it to answer the purpose for which it is intended most thoroughly; and if my opinion will be of any benefit to you, I have not the least objection to your making it public.

I am, Sir,
Your obedient humble servant,
JAMES JOHN FARQUHARSON.

Langton-House, May 2, 1809.

To MR. LESTER, &c. &c. &c.

SIR,

In answer to your's I have to observe, I consider your root-washer to be a machine that no farmer, who is in the habit of giving roots to his stock, ought to be without. I use it constantly in washing potatoes for 150 fattening sheep, besides hogs. A man, and a boy ten years old, will wash, without any exertion, 20 bushels an hour, or a man alone will do half the quantity. I have tried a few parsnips with it, and find it do them equally as well, and have no doubt but any kind of roots may be washed with it. I am very much pleased with it, and so must every one who has tried it.

With every wish for your success,

I am, your's sincerely,

JOHN CLARKE.

New-Park, Hadlow, Kent,
May 4, 1809.

To Mr. Lester, &c.

Lord Northampton acquaints Mr. Lester, that the potatoe-washer that was bought of him answers the purpose perfectly well, and is approved by all who have used it.

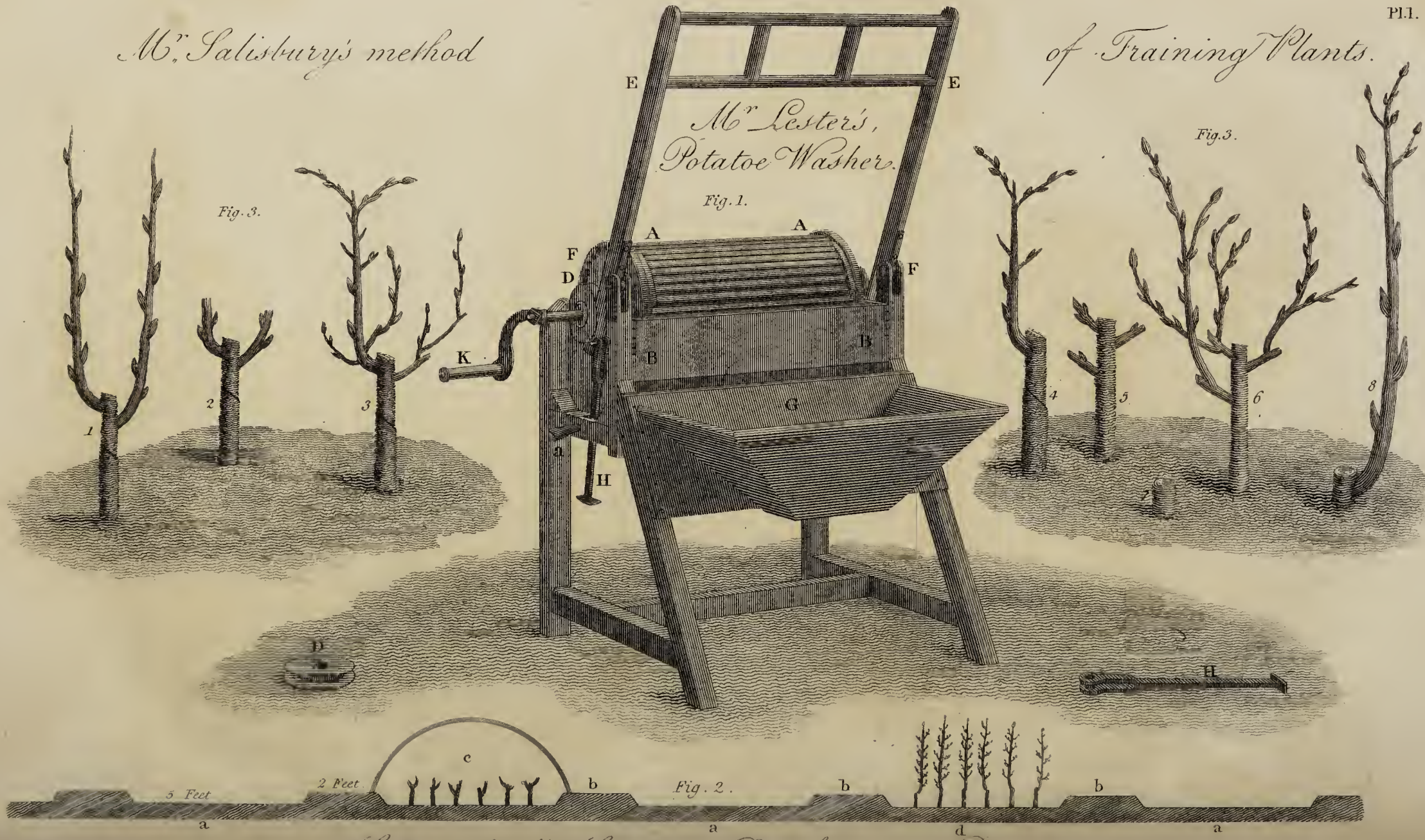
Castle-Ashby, May 5, 1809.

To Mr. Lester, &c.

Description of Mr. Lester's Machine for Washing Potatoes, &c. Plate I. *Fig.* 1.

This machine is shown in plate I. fig. 1. The potatoes are put into a cylinder or lantern A A, formed of two circular

Mr. Salisbury's method of Training Plants.



Drawn by J Farey Junr.

Section of Mr. Salisbury's Beds for young Plants.

Engraved by S Porter

cular boards, and a number of staves connecting them. Six of these staves are connected at the ends of two pieces of wood, so that they can be opened as a door, to put in or take out the potatoes. The cylinder turns round in a trough B B, filled with water and supported on four legs. On the end of the axis of the cylinder, two pulleys, one of which is shewn separately at D, are loosely fitted, these are intended for the cylinder to move upon, when full of potatoes; they run upon a swinging frame E E, which rests on centers at F F: when the long ends of the frame are pulled down, the other end is raised up, lifting the cylinder out of the trough B B; when the long end of the frame becomes the lowest, the cylinder rolls down on its wheels D, till it is over the hopper or wooden funnel G, under which a wheelbarrow or basket to receive the clean potatoes is placed: the door of the cylinder is now opened, and the contents turned out through the hopper into the vessel beneath it. When the frame is in this situation, the iron rods H, which are jointed to the short ends of the levers, form stops to the farther descent of the frame.

When fresh quantities of potatoes are to be washed, they are thrown in at the door of the cylinder, which is then shut up, and held shut by two small bolts. The end of the frame E is then raised up, so as to make the short end the lowest, and the cylinder runs down on its two wheels D over the trough B, till it is stopped by two iron prongs fixed on the end of the frame E; the cylinder is then suffered to fall down into the trough, and the potatoes, &c. are washed by turning it round by its handle K. *a* is a plug to let out the foul water.

Any person who has seen the laborious and imperfect method of washing potatoes in a tub, as practised in London, will be convinced of the utility of this machine, and

of its preserving the potatoes from being water soaked and spoiled, which is the case when they are long immersed in water.

TWENTY GUINEAS *were this Session voted to Mr.* WILLIAM SALISBURY, *of the Botanic Gardens at Brompton and Sloane-street, for his Method of Packing Plants and Trees intended for Exportation, so as to preserve their vegetative powers for many months. The following Communications were received from him.*

SIR,

WHEN I had the pleasure of seeing you last spring, I mentioned a supposed discovery I had made of a substance that would preserve trees and plants for a considerable time in a growing state, when packed up in close boxes, and that by this method they might be sent abroad to great distances with more success and less trouble than in any other. I now take the liberty of troubling you with the results of several experiments which I have since made, being certain that a greater demand will be found for the various articles cultivated in this country, and the persons who are engaged in that trade benefitted, when it is publicly known.

A box I have now sent, marked No. 1, contains specimens of tulip trees and liquid amber tress, which were packed up close from September 1807, till March 1808; they were then planted in my nursery; and the whole, amounting to several hundreds, have grown equally as well as they would have

have done if only transplanted from one part to another of the same ground.

In February last I sent to Boston in New England two packages in this way, each containing upwards of nine hundred trees of different kinds, and I have lately received the pleasing intelligence that they have all arrived safe and done well, but that some fruit trees sent to the same gentleman, packed in the usual way, were all spoiled, owing to the heat of the hold of the vessel in which *all the packages* were placed.

The other box I now send to you, marked No. 2, contains specimens of different trees which were packed up by my order, some of which have been in the boxes four months, and others a longer period, and the remainder now in the boxes are all in a similar state of preservation, and I have little doubt will remain three months longer, or more, without injury.

I must beg leave to observe, that the principal cause why things of this nature do not succeed in long journeys is, that if the package, (as is commonly the case) becomes by any means damp, it is very liable to heat, and the contents to be thereby very much injured; and if left dry, the moisture of the trees becomes exhausted, and they consequently die for want of nourishment. The mode recommended some years ago by Mr. Ellis, of planting the articles in tubs or boxes of earth, is attended with so much trouble, that it has been seldom found to succeed.

In packing my plants I make use of the long white moss, the *Spagnum palustre* of Linnæus, which grows in great plenty on peat bogs, and when decayed forms a great portion of that substance. It differs materially from other vegetables in possessing the power of retaining moisture in a wonderful degree, and it does not appear to be liable to fer-

mentation in any situation, even when laid together in great quantities; hence a decomposition does not readily take place, and it preserves the power of affording moisture and nutriment to plants when completely enveloped in it, as appears by the above experiment.

I am, with great respect, Sir,

Your very obedient

and most humble servant,

WILLIAM SALISBURY.

Botanic Garden, Brompton,
Jan. 9, 1809.

To C. Taylor, M.D. Sec.

We hereby certify that we packed up the several trees and plants at the times marked on the labels of those in the box No. 2, by desire of Mr. Salisbury, and that the said specimens have remained ever since in the boxes as above described.

Alexander Reith,

John Woodhood.

Dear Sir,

The prosperity of a country was never more rapidly promoted than we have happily witnessed in our own nation within a few years, since the study of natural history has become so general amongst all ranks of society; and probably nothing has contributed so much thereto as the extended knowledge of botany, and the numerous collections of vegetable productions which have lately been introduced from

from all parts of the world. From such sources our agriculture, and many of the arts, have been greatly improved, yet much still remains to be accomplished by the assiduous botanist; for instance, neither the plants producing the cinchona, or which nourish the cochineal, have yet reached our soil, nor are we even acquainted with those which yield many of our most useful drugs. This is owing, in a great measure, to the difficulty of procuring perfect seeds, it being a well known fact that many kinds will not vegetate if left dry but a short time after gathering; and the difficulty of keeping plants alive during long voyages has been almost an insuperable obstacle. Impressed, therefore, with the importance of the subject, I wrote to you on the 9th of January last, and have now the pleasure of communicating to the Society of Arts, &c. for the benefit of the public, further particulars of the mode I have discovered, and by which I am convinced, from actual experiments, trees or plants of all kinds may, with ease and certainty, be transported from any part of the globe to this country and our colonies; being confident that our commerce will be improved by a more certain mode of exporting the numerous fruits with which our nurseries exclusively abound.

I had, sometime ago, an opportunity of viewing a large heap of moss *(Spagnum palustre, Linn.)* which had been collected for decorating a grotto. I observed that although it had lain exposed for several months in the heat of summer, yet with the exception of the very outside of the heap, its particles appeared in the same state as when first collected, and that a gentle state of vegetation was still going on. I moreover observed, that several species of heaths, grasses, and plants, that had been by chance collected in the heap were preserved, and in several instances had the same appear-

ances as when growing, others were a little blanched for want of light; but even these were alive and capable of growing by proper management. These circumstances led me to make some experiments to ascertain how long trees of different kinds might be preserved in this substance, when excluded from the external air, and I so far succeeded as to keep them for six months, part of which time had been extreme hot weather, and I had afterwards the pleasure of getting them to grow in my garden equal to any that had been transplanted the same season.

As I have endeavoured to discover what property this particular moss possesses when compared with others generally used for packing plants, I shall remark, that, as its name implies, it is in a great measure an aquatic, and consequently not liable to injury from moisture, which it has the power of retaining in a wonderful degree, whilst all the species of Hypnum cannot be prevented from rotting, unless they are kept perfectly dry; and although the mosses in general, when moistened with water, are useful to wrap round the roots of trees when packed up, yet they gradually undergo a decomposition, and consequently if plants were completely enveloped therein, they would decay in time from the same cause, which I have proved in many instances.

I was therefore led to ascribe the advantages which the spagnum palustre possesses, to its property of holding water, and resisting fermentation, and I am confirmed in this opinion, by a letter which I have received from my worthy friend Mr. A. T. Thompson, to whom I had submitted some of that moss, for a chemical analysis, and whose letter I now inclose.

The manner in which I have been accustomed to pack

up

up plants is as follows. When the moss is collected from the bogs in which it grows, it should be pressed, in order to drain out as much moisture as possible, and having boxes prepared of sufficient size for the young trees, (which may in some instances be shortened in their branches), I lay in the bottom of the box as much moss as will, when pressed with the foot, remain of the thickness of four inches. A layer of the plants should then be put thereon, observing that the shoots of each other do not touch, and that the space of four inches be left round the sides; after this, another layer of moss, about two inches thick, is placed, and then more plants; and I thus proceed, till after the whole of the plants are pressed down as tight as possible, and the box filled within four inches of the top, which space must be filled with the moss; the contents are then trodden down with the foot, and the box nailed closely up.

When trees are intended to be sent to distant countries, I should advise such to be selected as are small and healthy, and when arrived at their place of destination, they should be cut down quite close, even to the second or third eye from the graft, or in trees not grafted, as near the former year's wood as possible; and having prepared beds according to the following mode, let them be planted therein, to serve as a nursery; for trees of every description, suffer so much from removal, that unless the weather is particularly favourable, they do not recover it for some time, even when only transplanted in their native climate. I do not think it advisable, therefore, to plant them at once, where they are liable to suffer from want of water, and other attentions necessary to their perfect growth. I therefore recommend beds to be thus prepared for them, viz. On some level spot of ground, mark out beds five feet wide, and leave walks

or alleys between them, of two feet wide, throwing a portion of the earth out of the beds upon the alleys, so as to leave them four inches higher than the beds.

If the ground is shallow, and the under stratum not fit for the growth of trees, the whole should be removed, and the beds made good with a better soil.

The advantage arising from planting trees in this way is, that the beds being lower than the walks, the water which is poured on, for support of the trees, is prevented from running off. The plants are also less exposed to the influence of the winds, and if a dry and hot season should immediately follow after they are planted, hoops covered with matts, straw, or canvas, may be placed over them, to prevent the sun from burning the plants, and to hinder a too speedy evaporation of moisture.

In warm climates, canvas cloth will answer best for these shades, to be fixed during the heat of the day, so as to prevent the surface of the mold from becoming dry, and if a little water be sprinkled upon the canvas, once or twice during the day, it will keep it tight, and produce a moist atmosphere underneath, which will greatly facilitate the growth of the plants.

These shades should be removed at the setting of the sun, and the plants then watered, when they will also receive the benefit of the dews during the night. In the morning the shades should be replaced, and the plants thus protected till they can stand the open air, to which they should gradually be enured by removing the shades daily more and more, till they can be wholly taken away.

The plants should be planted in rows across the beds, at about three inches distance from each other, and the rows should be about nine inches apart, and when the plants have

grown

grown thus for one year, they may be removed to the places where they are intended to remain.

I remain, dear Sir,

Your obedient servant,

WM. SALISBURY.

Sloane-street, March 1st, 1809.

To C. TAYLOR, M. D. SEC.

DEAR SIR,

THE analysis of the moss which you put into my hands, has afforded the following result.

A portion of it macerated in boiling distilled water, for twenty-eight hours, yielded a pale straw-coloured, slightly mucilaginous infusion, which was nearly insipid, and of a disagreeable odour.

The infusion of litmus was reddened when added to it. With the nitrat and acetite of barytes, insoluble precipitates were thrown down, as was also the case with the acetite of lead. Sulphat of iron gave a very slight olive tinge to the infusion, after standing eight hours; and with the solution of gelatin, a small quantity of a whitish floculent precipitate was formed, after standing twelve hours. The oxalic acid, a solution of pure ammonia, and the nitrat of silver, produced no effect on the infusion.

The conclusion to be drawn from these results is, that the moss contains in its composition, *besides the ordinary principles of vegetables, a very small portion of gallic acid, and of tannin, some sulphuric acid, in an uncombined state, mucilage, and extractive matter.* No inference can, therefore,

fore, be drawn from these results, which explains in any degree the effects of the moss in preserving the vegetables that are enveloped in it; nor is there any effect produced in the air by it, more than is produced by mosses in general when in an uncorrupted state; other causes to explain the preservative property of the moss must therefore be looked for, and these are to be found, in my opinion, in the peculiar qualities of the moss, connected *with its own existence as a living plant.*

Plants which are taken from the earth, and packed up to be sent abroad, or to any distance so considerable as to keep them for some length of time in the package, will not vegetate when again taken out of it and planted, unless some degree of vitality has been preserved during the period that they have been out of the ground.

To preserve this, four circumstances are essential in the packing material; softness, in order that the delicate parts of the enveloped vegetable be not injured; looseness, that a certain portion of air be contained in it, and that an equal temperature may be preserved; moisture, and the power of resisting fermentation, and the putrefactive process. All of these circumstances this moss possesses in a remarkable degree; its power of absorbing and retaining moisture is more considerable than that which perhaps any other moss possesses, it is light, soft, and loose in its texture, and its vitality is so considerable, as to carry on the powers of vegetation, and consequently to enable it to resist fermentation and putrefaction for a very great length of time.

Placed under such circumstances, the plants which are packed up in the moss, enjoy a kind of life in some degree similar to that enjoyed by an animal in a torpid state, the functions of life are supported at a very low state, but still sufficient to preserve them in a situation to be acted upon,

by

by favourable circumstances when again planted. Such is the theory I have formed of the effect of this moss in preserving plants; the many necessary calls of my profession have not allowed me time sufficient to investigate the subject, with all the attention I could have wished to have bestowed on it, and must also plead my apology, for the hasty manner in which my opinion is presented to you. I consider the discovery of much value, both to Botany and Agriculture.

Believe me

Your's truly,

A. T. THOMPSON.

February 15*th*, 1809.

To Mr. Wm. Salisbury.

Dear Sir,

In addition to the account which I delivered to you, respecting my method of packing plants for exportation, in the spagnum palustre moss, I beg leave to observe, that at the time the case was packed up, which I sent to the Adelphi in January last, a similar package was sent from me to Sierra Leone, by desire of the African Institution, who wished to introduce into that colony the mulberry tree for feeding silk worms; also different kinds of vines, and other fruit trees, amounting in the whole to nearly fifteen hundred trees.

They arrived there in about four months after the package was made up, and the trees were planted under the direction of a gentleman, to whom I gave a copy of the instructions,

structions which accompanied my former letter to you of last January. The following account of them has since appeared in the African Herald. "A number of fruit and "other trees, amongst which are the white and red mul- "berry, vines, &c. have been sent from London, by order "of the African Institution, all of which at present are "growing here, in a very flourishing state, and a piece of "ground is clearing in the mountains, to which they are "intended to be removed the next season."

I requested the gentleman, to whose management the plants were entrusted, to acquaint me how they succeeded, and to use the same moss in packing up for me, some of the wild plants of that neighbourhood, which he did in June last, and at the same time I received a letter from Mr. Macaulay of that place, with the following intelligence. "The "plants which were bought of you, and sent out by the "African Institution, all thrive very well, except the tea- "tree, sour sop, and a few others. The mulberries, &c. "grow most luxuriantly; most of the trees have been re- "moved to a more temperate situation, about three miles "from hence, where the remainder will soon also be "planted."

This letter arrived by the Derwent, Captain Colombine, who also brought me a box of plants packed up in the moss which had been previously sent with the above; and although the package did not arrive at Brompton before the 5th of October last, the plants were in a fine state of vegetation, and are now growing in my hot-house, and even the moss itself had preserved its vegetative state, and was perfect.

I have been thus particular in my description of the fact, as it is a corroborating proof of the utility of this moss for such purposes, and as the removal of trees cannot be other-

wise

wise effected in long voyages, without great expense and inconvenience.

I am, with great respect, Dear Sir,

Your's very truly,

WILLIAM SALISBURY.

Botanic Gardens, Brompton,
Nov. 18th, 1809.

To C. TAYLOR, M. D. SEC.

Reference to Mr. Salisbury's Method of managing Plants, after they are removed from the Package. See Plate I. Fig. 2, 3.

The plan fig. 2, at the bottom of plate 1, represents on a small scale, sections of the beds and alleys, with the plants as first set. The beds *a a*, are to be made on level ground, each bed to be five feet wide, with a space *b b b* between each for a road. A portion of the earth, is to be thrown out of the five feet beds, upon these roads, so as to raise them four inches higher than the beds, as shown in the plan; *C* represents the plants as first set out, with an arched cover of canvas cloth over them; *D* shows the plants when they have grown in the beds for some time, and in a state ready for planting out.

To illustrate the mode of cutting or pruning the plants, after they are removed from the package, fig. 3; No 1, is supposed to be a fruit tree, of one year's growth from the graft, that is a maiden plant. It is to be cut down as is represented in No. 2, and the next season's growth will form the tree No. 3. When it is fit to remain as a dwarf, or if pruned, as is represented in No. 4, it will form a standard, or such as are usually planted in orchards with high stems,

in

in order to be out of the reach of cattle. No. 5, is supposed to represent any small tree that has not been grafted, but cut down for planting. No. 6, is the form it will make the following season, when it may be left, or should it be intended for timber, or having a crooked stem, cut it close down to the ground as at No. 7, and it will throw up several shoots, which should be all cut off but the strongest, and that will make the tree No. 8. This may afterwards be kept trimmed up to a single stem, and a tree be formed much better than in any other mode.

N. B. The packages of plants, Nos. 1 and 2, mentioned in Mr. Salisbury's first letter, were opened and examined by the Committee of Agriculture, on the 16th of January 1809, when all the plants appeared to be in a state fit for vegetation. The boxes were then closed, and placed in the Society's model room, and opened again on the 30th May, at the distribution of the Rewards of the Society; the plants were then in a state fit for growth, having formed both new roots and branches during their confinement. It appears, therefore, that the plants were from their first inclosure by Mr. Salisbury, thus preserved nine months out of the earth.

The SILVER MEDAL *of the Society was this Session voted to* CHARLES LE HARDY, *Esq. of the Island of Jersey, for the following Communication on the Culture of Parsnips, and their Utility in Feeding Cattle.*

SIR,

HAVING observed in the book of Premiums offered by the Society, that they wished for information on the culture of parsnips,

parsnips, which are much used in the island of Jersey; as having practised it for many years, I take the liberty to communicate what I know on the subject, with the result of some comparative experiments.

The culture of parsnips and beans, is looked upon as one of the regular courses of crops in the island. There is no farmer, be the extent of his grounds ever so small, who does not yearly plant a proportionate quantity, for the purpose of fattening his hogs and cattle, or of feeding his milch cows.

A few years ago, the culture of potatoes was substituted by some farmers to that of parsnips, and apparently with advantage; but further experience, has brought them back again to their former practice. Potatoes produce more weight and measure on a given extent of ground, and may be cultivated with less expense; still the parsnip is found to answer best for the farmer's purpose. A perch of the island, which is twenty-four square feet, will produce on an average crop, seven cabots of potatoes, each weighing forty pounds, the same extent in parsnips will only average six cabots, which weigh only thirty-five pounds each, making twenty pounds weight in favour of the potatoes, but they are not so nutritious as parsnips.

Parsnips will thrive almost any where, but better in a deep stiff loam. They are generally cultivated in the island after a crop of barley, in the following manner.—At the end of January or the beginning of February, the soil which requires for that purpose to be stirred from the bottom, is either dug with spades after a skimming plough, or with two ploughs of different shapes following one another. The latter of the two, invented some years ago by a farmer in the island, will go to a depth of fifteen inches. In both these ways, the neighbouring farmers assist each other: In

the season, it is not uncommon to see forty or fifty men in one field digging after a plough. When the large plough is used, less men are required, but more strength of cattle; two oxen and six horses are the team generally used. Those days are reckoned days of recreation, and tend to promote social intercourse amongst that class of men.

After the ground has been tilled in this way, it is coarsely harrowed, and a sufficient number of women are provided to plant beans. These are dibbled in rows three by three ⁘ at the distance of five feet from row to row. Two women may plant one vergée in a day. Two vergees and a half being equal to an English acre. Three sixtenniers of parsnip seed, (about $\frac{1}{4}$ of a Winchester bushel) are then sown upon each vergee, and the whole is finely harrowed.

This crop now requires no attendance till the month of May, when weeding becomes necessary. This is the most expensive part of the culture. It is generally done by hand, with a small weeding fork, and as the parsnips require to be kept very clean, the expense is proportionate to the quantity of weeds. This last summer four women were employed twenty-eight days each in weeding about five vergees. I tried a few perches with the hand-hoe, and thinned them like turnips; they proved finer than those which were hand-weeded. In Guernsey they make use of the spade for that purpose.

In the beginning of September, the beans are pulled up from among the parsnips, and about the latter end the digging begins. The instrument used, is the common three-pronged fork. This work is done gradually as the cattle want them, till the ground requires to be cleared for sowing wheat, which after parsnips is generally done about the middle of December. They are reckoned an excellent fallow for that kind of grain, and the finest crops are gene-

rally

rally those which succeed them; as it is a tap-rooted plant, it does not, like the potatoe, empoverish the surface, but leaves it mellow and free from weeds, to a succeeding crop.

When parsnips require to be kept for the use of cattle, they are brought dry under sheds, and will keep good without any care till the end of March. Should they require to be kept longer, they are layed in double rows over one another, their heads outward, with alternate strata of earth, which when finished, have the appearance of small walls, or if made circular of small towers. Those for seed are always preserved in this manner, and sometimes carrots and beets for culinary purposes.

Parsnips are not injured by frost; after having been frozen, they are fit for vegetation; the only sensible alteration is their acquiring a sweeter taste, and by that perhaps becoming more nutritive. They are given raw to hogs and to horned cattle. Though horses are fond of these roots, they are not suffered to eat them, as they make them languid, and are apt to injure their sight. Their leaves when wet are so caustic as to blister the hands of the weeders, and sometimes to occasion a violent inflammation in the eyes and udders of the cattle feeding upon them.

Cows fed on parsnips in the winter months, give a greater quantity of milk and butter, and of better flavour, than those fed upon potatoes. The butter is nearly equal to that from spring grass. Though the root of this plant has the quality of improving that article, it must be observed, that the leaves give it a very disagreeable taste, which however is of no consequence when intended to be potted, as it goes off in a short time.

Parsnips are dangerous food for sows before they farrow, and might occasion them to lose their litter. Hogs may be

fattened with them in about six weeks. It is the custom during that time, to thicken their swill with the meal of beans and oats ground together. Pork fattened in this way is very firm, and does not waste in boiling.

Horned cattle may be fattened with parsnips in about three months. I never knew them used for sheep.

It is the general opinion in the island, that hogs or cattle fed on parsnips, may be brought in a condition for slaughtering, in less time, and with half the quantity, that would be required of potatoes, The butchers are sensible of the superiority of the former, and will give a halfpenny per pound more for cattle fattened with them, than for such as have been fed any other way. Upon enquiry I was informed, they always contained a greater quantity of tallow.

This I believe to be a full account of the culture and use of the parsnips, and a just comparison with the potatoe. Should the Society wish any farther information, either on this, or on my Telegraph, I shall think myself in duty bound to give it.

I remain, Sir,

Your most obedient humble servant,

CHARLES LE HARDY.

I have read with attention the foregoing memoir on Parsnips, and am of opinion, that it is a full and correct statement of the culture of that root in the island of Jersey. I can also certify, that the writer (Major Le Hardy), has made several experiments, which have been much approved of.

F. J. LE COUTEUR,

President of the Jersey Agricultural Society.

We,

We, the undersigned Members of the Society, perfectly agree in the opinion expressed by the President.

FR. LE COUTEUR,
Rector of Grouville.

P. DURELL.

J. MALLET,
Rector of St. John's.

CHARLES LE MAISTRE.

A. BISSON,
Rector of St. Laurence's.

The SILVER MEDAL *was this Session voted to the* REV. JAMES HALL, *of Chesnut Walk, Walthamstow, for preparing from Bean Stalks, a Substitute for Hemp. The following Communication was received from him, and Samples of the Fibres are preserved in the Society's Repository.*

SIR,

THOUGH it has not been attended to, nor, so far as I know, has ever been mentioned by any one, yet it is certain that, according to its size, every bean plant contains from 20 to 35 filaments, or fibres, running up on the outside, under a thin membrane, from the root to the very top all around, the one at each of the four corners being *rather thicker*, and stronger than the rest. It is also certain that, next to Chinese, or sea-grass, in other words, the material with which hooks are sometimes fixed to the end of fishing lines,

the filaments, or hempen particles of the bean plant, are among the strongest yet discovered. These with a little beating, rubbing and shaking, are easily separated from the strawy part, when the plant has been steeped 10 or 12 days in water; or is damp, and in a state approaching to fermentation, or what is commonly called rotting. Washing and pulling it through hackles, or iron combs, first coarse, and then finer, is necessary to the dressing of bean-hemp; and so far as I have yet discovered, the easiest way of separating the filaments from the thin membrane that surrounds them.

From carefully observing the medium number of bean-plants in a square yard, in a variety of fields on both sides the Tweed, as well as in Ireland, and multiplying them by 4840, the number of square yards in an acre, and then weighing the hemp, or filaments of a certain number of these stalks, I find that there are at a medium, about 2cwt. of hemp, or these filaments, in every acre, admirably calculated for being converted into a thousand articles, where strength and durability is of importance, as well as, with a little preparation, into paper of all kinds; even that of the most delicate texture.

Now since there are, at least 200,000 acres of ticks, horse and other beans planted in Great Britain and Ireland, and since where there is not machinery for the purpose, the poor, both young and old, females as well as males, belonging to each of the 9700 parishes in England, &c. where beans are raised, might (hemp having risen of late from 60 to 120 pounds per ton), be advantageously employed in peeling, or otherwise separating these filaments from the strawy part of the plant, after the beans have been threshed out. I leave it to the feelings of the Society for the Encouragement of

Arts,

Arts, &c. to judge of the importance of the idea held out here, not only to the poor, but to the landholders, and the community at large.

It is nearly twelve months since, by analizing its component parts, I discovered hemp in the bean plant. I would have written to you then, Sir, on the subject, and sent a specimen, but that I was trying experiments with other plants, as I am during my leisure hours doing at present; and I wished to ascertain in what degree this species of hemp is liable to injury from different situations, and the changes of the atmosphere. With a view to this, I exposed one parcel nearly 12 months, to all the varieties of the air within doors, and kept another nearly as long *constantly* under water, and find them not in the least injured. The chief difference I perceive is, that the one kept constantly under water, namely the *whitest* of the specimens sent you, has assumed a rich silky gloss, and a much more agreeable colour than it had before.

But though this is the case with bean-hemp *after* it is cleaned and dressed, and which, though stiff and hard when dry, is pliable and easily managed when rather damp or wet, it seems otherwise with it *previous* to its being separated from the straw. If bean-straw be kept for years under water, or quite dry, it produces I find hemp as good and fresh as at first. But, if the straw be sometimes wet, and sometimes dry, the filaments or fibres are apt to be injured. The specimens of bean-hemp accompanying this letter, in the form of oakum for caulking ships, having been long exposed to the varieties of the weather, previous to being separated from the straw, is a proof of its being considerably injured. If the straw of the bean was scattered thin on the ground, and exposed to the weather for two or three months, I have uniformly found that the hemp, or fibres,

are loosened, and easily separated from the strawy part, without any other process than *merely* beating, rubbing and shaking them, and perhaps this is the easiest way of obtaining bean-hemp; but then, from being thus exposed, and the fermentation that takes place in the strawy part, which is of a spungy nature, communicating itself to the fibres, or hemp, I find that these are generally less or more injured, though not so much so, in my opinion, as to prevent them from being excellent materials for making paper.

I have also found, and the importance of the idea will, I hope, be an excuse for mentioning it here, that, though the water in which bean-straw has been put to steep, in a few days generally acquires a black colour, a blue scum and a peculiar taste, yet cattle drink it greedily, and seemed fattened by it. But my experiments have hitherto been on too limited a scale to be able, in a satisfactory manner, to ascertain this last circumstance. When the water in which bean straw has been put to steep, becomes fœtid, which I find it is *scarcely* more apt to become than common stagnant water, on being stirred by driving horses or cattle through it, by a stick, or in any other way set in motion, (as is the case with all putrid water, even the ocean itself), the fœtid particles fly off, and the effluvia dies away.

When straw is to be steeped for bean hemp, the beans are to be threshed in a mill: the beans should be put to the mill, not at *right angles*, but on a *parallel*, or nearly so with the rollers, else the straw, particularly if the beans are very dry, is apt to be much cut. If the straw is *not* to be steeped, on putting the beans to be threshed at right angles, or nearly so, with the rollers of the mill, a certain proportion of the fibres, or hemp, may easily be got from the straw; these being in general not so much cut as the straw; but often found torn off and hanging about it

like

like fine sewing threads. The hemp thus taken off, though its lying under water for months would do it no harm, requires only to be steeped a few minutes, drawn through a hackle and washed, previous to its being laid up for use. If the hemp, or fibres, collected in this way (which is a fine light business for children, and such as are not able for hard work, and which requires no ingenuity), are intended only for making paper, they require neither steeping nor hacklings, but only to be put up into parcels and kept dry till sent off to the manufacturer.

The straw of beans contains a saccharine juice, and is highly nutritive, perhaps more so than any other; and like clover, the prunings of the vine, the loppings of the fig-tree, &c. produces a *rich* infusion, and uncommonly fine table-beer, as well as an *excellent* spirit by distillation. It is the hemp or fibres that prevents cattle from eating it. These, like hairs in human food, make cattle dislike it. The collecting of it, therefore, should never be neglected, nor the boys and girls in workhouses and other places, be permitted to be idle, while business of this kind would evidently tend both to their own and their employers' advantage.

It is a fact, that about the generality of mills for beating and dressing hemp and flax, a large proportion, in some inland places both of Great Britain and Ireland, amounting nearly to one-half of what is carried thither, is either left there to rot, under the name of refuse, or thrown away as of no use, because too rough and short for being spun and converted into cloth. Now, from the experiments I have tried, and caused to be tried, I have uniformly found, that, though too rough and short for being converted into cloth, even of the coarsest kind, the refuse of hemp and flax, on being

being beat and shaken, so as to separate the strawy from the stringy particles, which can be done in a few minutes by a mill or hand-labour, as is most convenient, becomes thereby as soft and pliable, and as useful for making paper, as the longest, and what is reckoned the most valuable part of the plant, after it has been converted into cloth and worn for years.

In its natural state, it is true the refuse of hemp and flax is generally of a brown and somewhat dark colour. But what of that? By the application of muriatic acid, oil of vitriol, or other cheap ingredient, well known to the chemists, as well as to every bleacher, such refuse, without being *in the least* injured for making paper, can, in a few hours, if necessary, be made as white as the finest cambric.

There are, at a medium, published in London, every morning, 16,000 newspapers, and every evening about 14,000. Of those published every other day there are about 10,000. The Sunday's newspapers amount to about 25,000, and there are *nearly* 20,000 other weekly papers, making in all the enormous sum of 245,000 per week. At a medium 20 newspapers are equal to one pound—hence the whole amount to about 3 tons per week, or 260 tons per annum. But though this, perhaps, is not one-half of the paper expended in London on periodical publications, and what may be called fugacious literature, and not one-fourth part of what is otherwise consumed in printing-houses in the country at large, yet there are materials enough in the refuse of the hemp and flax raised in Britain and Ireland for all this and much more.

Nor is this all, for as the bine or straw of hops, a circumstance well known to the Society, contains an excellent hemp for making many articles, so also will it prove a most

excellent

excellent material for making all kinds of paper. And it is a fact, that were even the one-half of the bine of hops raised in the counties of Kent, Sussex, and Worcester, instead of being thrown away, or burnt, after the hops are picked, as is commonly done, steeped for ten or twelve days in water, and beat in the same way as is done with hemp and flax, independent of what might be got from bean-hemp, and a variety of articles well-known to the Society, there would be found annually materials enough for three times the quantity of paper used in the British dominions.

I have the honour to be,
with much respect,
Sir,
Your most humble servant,
JAMES HALL.

Streatham, Jan. 9, 1809.

To C. Taylor, M. D. Sec.

Certificates of the Truth of the foregoing Statement.

Streatham, Surry, Jan. 9, 1809.

We, the undersigned, do hereby certify, that the specimens of hemp inclosed and sealed up by us, addressed to Dr. Taylor, Secretary to the Society for the Encouragement of Arts, Manufactures, and Commerce, Adelphi, Strand, are the produce of common bean straw:—That we never saw nor heard of bean hemp till lately: when the Rev. James Hall, who resides here at present, was trying experiments

experiments respecting it at Mr. Adams's farm, Mount Nod, and other parts of this parish :—That, in the present obstructed state of commerce with the Continent, it appears to us the discovery of bean hemp may be extremely useful to the manufacture of canvas, ropes, paper, &c. ;—And that, as it affords a new and important prospect of employment for the poor, we think Mr. Hall, the discoverer, is deserving of the approbation of the public. We shall only add, that as the Society for the Encouragement of Arts, Manufactures, and Commerce, have contributed so often in a high degree to the exertion of genius, the improvement of the arts, and the public good, we have no doubt but they will not only take the proper steps to prosecute the discovery and encourage the manufacture of bean hemp, but also, by some mark of their favour, show their approbation of Mr. Hall's merit in the discovery he has made, as well as of his high public spirit and liberality in communicating the discovery to the public without reserve.

WILLIAM ADAMS, Mount Nod.
EDWARD BULLOCK, Curate.
WM. GARDNER, Surgeon.

Streatham, Surry, Jan. 9, 1809.

THESE are to certify to the Secretary of the Society for the Encouragement of Arts, &c. London, and all whom it may concern, that having seen (at first to our astonishment) the Rev. James Hall, who has resided here for some time past, procuring hemp from common bean straw, steeped some days in water, we steeped some also, and easily got hemp

hemp from it; there being no mystery in the matter more than *merely* steeping the straw, peeling off the hemp, and then washing and cleaning it, by pulling it through a hackle or comb.

These are also to certify, that having tried bean hemp, and found it to take both wax and rosin, we have sewed with it, and find the fibres of which it consists in general so strong, that the leather never failed to give way sooner than the seam. We have only to add, that as hemp has of late become uncommonly dear, while much of it is bad, we anxiously wish the prosecution of the discovery, and the appearance of bean hemp in the market; and shall, so soon as we hear of its being spun and on sale, be among the first to purchase and use it.

JOHN HOUNE, Shoemaker.

THOMAS ALFORD, Shoemaker.

Letter from Mr. Hume, of Long Acre, to the Rev. James Hall.

SIR,

I INCLOSE a specimen of the bean filaments or thread which have been submitted to the bleaching process. The texture and strength seem not in the least to have been impaired, but retain the primitive tenacity; and I am persuaded this substance will prove an excellent substitute for hemp and flax, for the manufacture of various kinds of paper, cordage, and other materials. I did not find more difficulty in accomplishing the bleaching of this than in other vegetables

tables which I have occasionally tried, and I believe this article is susceptible of a still greater degree of whiteness.

I remain, Sir,

Your very obedient servant,

JOS. HUME.

Long Acre, Feb. 21, 1807.

Letter from Mr. H. Davy to the Rev. James Hall.

SIR,

I SHALL inclose in this paper a small quantity of the bean fibre, rendered as white as possible by chemical means.

It seems to bear bleaching very well, and as to chemical properties, differs very little from hemp.

The question, whether it is likely to be of useful application, is a *mechanical* one, and must be solved by experiments on its comparative strength.

I am, Sir,

Your obedient humble servant,

H. DAVY.

The

The SILVER MEDAL *of the Society was this Session voted to Mr.* WILLIAM SALISBURY, *of the Botanic Gardens, Brompton and Sloane Street, for Raising Grass Seeds, and Preparing Meadow Land. The following Communications were received from him, and a Sample of the Seed preserved in the Society's Repository.*

SIR,

I OBSERVE in a List of Premiums offered by the Society of Arts, &c. which fell into my hands, that the subject of select grass seeds has engaged their attention. I have, therefore, taken the liberty of sending herewith a sample of Festuca pratensis or Meadow fescue grass, which has been grown under my directions; it is a sample of upwards of twenty quarters, the produce of twelve acres of land, which have now been under that crop for the three last years.

As the cultivation of grasses, in general, hath engaged my attention very particularly for the last twenty years, I have had an opportunity of observing more attentively their several qualities, and must beg leave to observe, that the opinion formed by Mr. Curtis and others of the two species of *poa*, have been proved to be erroneous in several respects, and which it will be highly proper hereafter to notice, as I have found, after numerous experiments, that neither of them is likely ever to be brought into general cultivation, for several reasons which I have fully ascertained from facts. If the mode I have practised of managing the *fescue*, *foxtail*, and other grasses, whether with the view of producing

seed,

seed, or the best mode of using them in forming pasture and meadow-land, be deserving the notice of the Society, I shall be happy at a future period to send it to you.

I beg leave to mention, that there are several meadows at Roehampton, the property of the late Benjamin Goldsmid, Esq. which have been made at different times under my management with the grass seed I had previously raised, and which will challenge any other grass land in similar situations in the kingdom. The turf and pasturage of them were formed in less time by far than is to be done by the usual modes practised.

I am, most respectfully, Sir,

Your very humble servant,

WILLIAM SALISBURY.

Brompton Botanic Garden,
March 6, 1809.

To C. Taylor, M. D. Sec.

Certificates were received, dated March 5, 1809, from William Underell, Richard Hook, and Thomas Hook, stating, that in the year 1808 there was grown upon Lee-Place Farm, near Godstone, in Surry, in the occupation of Mr. Pennington, one hundred and sixty-five bushels of Meadow fescue grass seed, which was produced from about twelve acres of land, and that it was free from mixture of other grasses or weeds, and that they assisted in harvesting and threshing the whole.

Observations

Observations, in addition to the preceding Statement, on the Method of laying down Pasture and Meadow Land, with Account of some Pastures made with the Festuca Pratensis, Linn., or Meadow Fescue-Grass and Clovers, by Mr. William Salisbury.

DEAR SIR,

IT is now nearly thirty years since my much respected friend and partner, Mr. Curtis, wrote his Observations on several of our native grasses, better adapted to the purposes of pasture than ray-grass, the only species of these various tribes that was then, or even now, generally used for the purpose; yet it is acknowledged, by all persons conversant on this subject, that it is inferior to many others, both in produce and nutriment, and also that it remains in the ground but a short time, a fact which attaches also to all the clovers, and is to be lamented by the grazier.

I have been often more mortified than surprised to find, that after so much has been written on this interesting subject, and when other grass seeds may be obtained, that almost every person is of opinion, that they cannot be cultivated to advantage. I am ready to admit much truth in this, when they are sown according to the common system in practice, which I have frequently convinced myself and others to be erroneous, and that it prevents these useful plants from succeeding after the seeds have been sown.

It will readily be supposed that I allude to the mode of laying down land to grass under a crop of spring corn, and I am fully sensible that many persons will say that it would be madness to sacrifice the benefit of a crop of barley or oats,

where the land is in fine order, and whilst we can have a crop of grass under it.

To this I reply, that there is no land whatever, when left for a few months in a state of rest, but will produce naturally some kind of herbage, good and bad; and thus we find the industry of man excited, and the application of the hoe and the weeder continually among all our crops, this being essential to their welfare. I cannot help, therefore, observing, how extremely absurd it is to endeavour to form clean and good pasturage under a crop that gives as much protection to every noxious weed as to the young grass itself *. Weeds are of two descriptions, and each require a very different mode of extermination: thus if annual, as the charlock and poppy, they will flower among the corn, and the seeds will ripen and drop before harvest, and be ready to vegetate as soon as the corn is removed; and if perennial, as thistles, docks, couch-grass, and a long tribe of others in this way, well known to the farmer, they will be found to take such firm possession of the ground that they will not be got rid of without great trouble and expense.

Although the crop of corn thus obtained is valuable, yet when a good and permanent meadow is wanted, and when all the strength of the land is required to nurture the young grass thus robbed and injured, the proprietor is often at considerable expense the second year for manure, which taking into consideration the trouble and disadvantage at-

* I do not wish it to be understood that I allude to the system practised in Surry and other counties, of sowing clover and rye-grass under barley, when it is intended only for a season or two, in order to change the course of crop, and to be returned again to arable crops as soon as the clover is exhausted, or what is more frequently the case, overpowered with the weeds that have been nurtured with it; this is totally different, and is not intended for a permanent crop.

tending

tending it, more than counterbalance the profit of the corn crop.

To accomplish fully the formation of permanent meadows three things are necessary, namely, to clean the land, to procure good and perfect seeds adapted to the nature of the soil, and to keep the crop clean by eradicating all the weeds, till the grasses have grown sufficiently to prevent the introduction of other plants. The first of these matters is known to every good farmer,—the second may be obtained,—and the third may be accomplished by practising the modes in which I have succeeded at a small comparative expense and trouble, and which is instanced in a meadow immediately fronting Brompton Crescent, the property of Angus Macdonald, Esq. which land was very greatly encumbered with noxious weeds of all kinds, but, by the following plan, the grasses were encouraged to grow up to the exclusion of all other plants, and though it has been laid down six years, the pasturage is now at least equal to any in the county.

Method of laying down Land in Grass.

Grass seeds may be sown with equal advantage both in spring and autumn; the land above-mentioned was sown in the latter end of August, and the seed made use of was one bushel of meadow fescue, and one of meadow fox-tail grass, with a mixture of fifteen pounds of white clover and trefoil; the land was previously cleaned as far as possible with the plough and harrows, and the seeds sown and covered in the usual way. In the month of October following, a most prodigious crop of annual weeds of many kinds had grown up, were in bloom, and covered the ground and the sown grasses; the whole was then mowed and carried off the land,

and by this management all the annual weeds were at once destroyed, as they will not spring again if cut down when in bloom. Thus whilst the stalks and roots of the annual weeds were decaying, the sown grasses were getting strength, during the fine weather, and what few perennial weeds were amongst them, were pulled up by hand in their young state. The whole land was repeatedly rolled to prevent the worms and frost from throwing the plants out of the ground; and in the following spring it was grazed till the latter end of March, when it was left for hay, and has ever since continued a good field of grass.

The meadows at Roehampton, belonging to the late B. Goldsmid, Esq. were laid down with two bushels of meadow fescue-grass, and fifteen pounds of mixed clover, and sown in the spring along with one peck and a half of barley, intended as a shade to the young grasses; the crop was thus suffered to grow till the latter end of June, and then the corn, with the weeds, were mowed and carried off the land; the ground was then rolled, and at the end of July the grasses were so much grown as to admit good grazing for sheep, which were kept thereon for several weeks. It should be observed, that the corn is to be mowed whilst in bloom, and when there is an appearance of, or immediately after rain, which will be an advantage to the grasses, and occasion them to thrive greatly.

I sowed some fields for the same gentleman in autumn in the same way, and found them to succeed equally well.

I intended to have made some remarks on some properties which had escaped Mr. Curtis's notice in his Observations, and which do not add to the celebrity of all the grasses he has mentioned, but as I have partly prepared a short history of the nature of all our plants used in agriculture, so far as relates to their properties in a wild state, and

the

the effect of cultivation upon them, I shall, for the present, defer any further remarks thereon.

I remain, dear Sir,

Your very obedient servant,

WILLIAM SALISBURY.

Botanic Garden, Brompton,
August 1, 1809.

To C. Taylor, M. D. Sec.

The Thanks *of the Society were this Session voted to Mr.* John Saddington, *of Finchley, for his Communication of the following comparative Experiments on the Culture and Application of Kohl Rabi, Drum-headed Cabbage, and Swedish Turnips.*

SIR,

Being actuated by the most patriotic motives, I beg the favour of you to lay the following Communication before the Society of Arts, together with the plants herewith sent. I will endeavour to give you an account with as much brevity as is in my power to render myself intelligible, of the nature of the soil, the mode of cropping, and the produce thereof, the plot of land being about two and a half acres, and laying on a dead flat. I obtained leave in 1805 to under-drain and break up the same, the grass being sour and useless.

I cut two main drains, forty-two inches deep, gradually rising at top to twenty-eight inches, to give a sufficient fall, with sixteen branches twenty-four inches deep, rising to sixteen inches, terminating at top like the letter Y: the drains were wooded with elm, and laid with my own hands; this work was done in February. The soil is a loam, with clay and gravel under. On the 20th March I sowed three and a half bushels of oats per acre, which produced thirty-nine bushels per acre, weighing forty-one pounds per bushel. The straw was used as it was threshed for litter to stalled oxen. The 28th of September seeded with winter tares four bushels of seed per acre. Eat them off in May with sheep. Two fallow ploughings were given in June and August. About two hundred sheep were brought in at nights by way of fold. The 11th of October sowed three bushels of Thanet wheat per acre. Brined and limed in March, twice fed down with sheep. Produce, twenty-nine bushels per acre, weighing fifty-nine pounds per bushel, and very near three and a half load of straw per acre. The stubble was mowed and cleared off, and the land got ready for turnips. Three pounds of seed were sown the last week in August, when the plants were just making their appearance. Two quarters of gypsum were sown by hand to prevent the fly, which had the desired effect.

This proved a very valuable crop; having two hundred ewes which gave suck, it was a great acquisition to their milk. This induced me to try three experiments last spring with kohl rabi, or purple turnip-cabbage, drum-headed cabbage, and Swedish turnips.

With due respect I beg to recommend to the Society kohl rabi, as a prolific and nutritious plant for the feed of sheep and neat cattle; and green food may be produced by this

this means from October until May. To ensure a succession of keep, seed should be sown in March, April, and May. The plant bulbs above the ground; the leaf is much like that of beet; it will stand in defiance to the severest frost; and as a proof thereof, I have cut with my knife several of the plants through the crown two inches deep, and they have stood three months afterwards in a sound state; some of them are here produced. The plants may be transplanted like those of cabbage: many of those transplanted at eighteen inches apart, I have found to weigh ten and eleven pounds a-piece.—I must now beg leave to introduce my method of cultivation, with the average weight of the crop.

On the 14th of May, I sowed four ounces of seed broadcast, and transplanted about forty-six pole therefrom, on the 18th of June, at twelve inches apart each way; the weight of a square pole is seven hundred and thirty-two pounds, on an acre fifty-eight ton six hundred eighty-eight pounds, taking each plant to average three pounds. The beauty and regularity of this crop in my idea overbalanced the trouble of transplanting. I likewise sowed upon a bed in the garden, the second week in March, eight ounces of drum headed cabbage. The fly and slug were very destructive to the plants. I transplanted them the second week in June, upon ridges thirty-six inches apart, the land being dunged at the rate of twelve load per acre. Some of the cabbage weighed thirty pounds. I think the average about twelve pounds each, or twenty-five ton eighteen hundred sixty-four pounds per acre. The caterpillar was very destructive. I have picked off in a morning as many as would fill a quart pot. Although the kohl rabi was planted near to the cabbage, I never saw a caterpillar upon

any of the plants. In the middle of June, I sewed the remainder of the field with Swedish turnips, but lost two-thirds of this crop by the fly. One of the best of the Swedish turnips is here produced, in order to show the great superiority of the kohl rabi, as there is not that waste in being eat upon the ground, as it bulbs above, and the Swedish turnip in the ground. When the sheep have eaten the turnip level with the ground, and scooped out the inside, the remainder serves as a reservoir for the dirt and filth. The produce of this field, has been sufficient for nine score of suckling ewes with rowen for five months. I sent to market at Christmas last, house-lambs fattened with milk only, which weighed eleven stone and one pound each, alive, at eleven weeks old. Should the Society consider these observations worthy of notice, I shall feel myself happy in hearing from you.

I am, Sir,

Very respectfully

Your obedient servant,

JOHN SADDINGTON.

Finchley, Middlesex,
Feb. 13, 1809.

To C. Taylor, M. D. Sec.

The

The THANKS *of the Society were this Session voted to Major* SPENCER COCHRANE, *of Muirfield-house, near Haddington, North Britain, for the following Communication on the Properties of Furze or Whins.*

SIR,

THE Society having honoured me, by publishing in their 25th Volume, my communication, stating the advantages arising from the culture of poppies, and that seven ounces of fine salad oil were furnished by expression from two pounds of the seed; I now beg leave to add, that I am informed, considerable quantities of poppy seeds have been lately bought up, in different parts of the country, and the expressed oil from them sold at the price of Florence oil; and that emulsions made from poppy seeds, answer in every respect the purposes of those made from almonds.

The following communication may perhaps be deemed worthy the notice of the Society, it relates to the use of Whins or Furze. Its utility as food for cattle has been long known, though probably not sufficiently appreciated, but as a medicine, I never till within a few years heard of it. My information was first received from a gentleman who has been an officer in the army, a friend and relation of mine; he is seventy-five years of age, and in good health, and what he says may be depended upon. In October 1806, he informed me that his sight had been much strengthened by drinking an infusion of whin or furze blossoms, dried in the sun in summer. The infusion is made from a tea-cup full of the blossoms, in a tea-pot in the manner of tea, and the dose half a tumbler at night; that he never had a cough since

he

he first used it, which was fifty years ago; it acts as a diuretic, and by perspiration, and when the dose is increased, promotes sleep. In October 1808, he informed me that he still continued the use of the whin-tea, that he had no cough, and that his skin was remarkably fine and soft, which he attributes to its use.

I have also used the whin blossoms with good effect myself, and can safely recommend them.

My friend supposes the young shoots of furze may answer if the blossoms cannot be got; he informs me, that when an epidemical cold came from Germany, and destroyed many horses in England, the east wind continued six weeks, and the infection came over to Ireland, where he had the care of a troop, in so poor a village that he could get neither bran nor malt for mashes, which were ordered for the horses with sulphur, after bleeding: That he ordered the men to cut furze, and ordered them to give it to the horses, after they had beat it well on the pavement: that at first they had to mix it with oats, but that in two days the horses devoured it like clover. That by these means he recovered them all, though every other troop lost two or three; and that his was the only troop in good condition at the review.

I remain with esteem, Sir,

Your sincere and humble servant,

SPENCER COCHRANE.

Muirfield, Jan. 22, 1809.

To C. Taylor, M. D. Sec.

The

The following Communication was received from Mr. CHARLES WAISTELL, *of High Holborn, in Addition to the interesting Observations made by him, for the Purpose of ascertaining the Value of growing Timber Trees, at different and distant Periods of Time. For those Observations, the Society's* GOLD MEDAL *was given him in May* 1803, *and the Papers Printed in the 26th Volume of the Society's Transactions.*

SIR,

IN the Society's last volume, under the head of Agriculture, are some tables and observations of mine, on the growth of timber; and I have given one instance of six acres of very bad land, planted with Scotch firs under my directions, which at 29 years growth, and at the small price of 1*s.* a foot, had paid the owner 5*l.* per acre per annum compound interest. My motive in communicating these tables, observations and facts to the public, was to promote the planting of inferior and almost useless soils, in order to obtain from them timber of our own growth, sufficient for at least many of the purposes for which foreign timber is imported, at an immense annual expense. For instance, much of such inferior soils will be found on Cannock Heath in Staffordshire, on the moor lands in the north of that county, and on the moors in Derbyshire, Yorkshire, and northwards to Scotland, also on Bagshot Heath, Salisbury Plain, the heaths and wastes in Sussex, Hampshire, and Dorsetshire, and in many other counties in England, and also in Scotland and Wales. In that paper I suggested,

I suggested, that information of very great value on the subject of planting, might be obtained from Noblemen and Gentlemen, to whom the Society had given Medals and Premiums for planting trees, if they would communicate to the Society their subsequent observations on such plantations; but it is to be regretted that the Society have not yet received any communications on the subject.

I have been solicited to re-publish my tables, &c. by different gentlemen, who I have reason to believe are very competent to judge of them, and I have in consequence, several additional tables in forwardness with this view; but, previous to such publication, I wish to be furnished with a great variety of facts as to the growth of timber, and the management of plantations; and I shall feel much obliged to any persons, who will have the goodness, to send me their observations and statements of facts, respecting the growth and management of plantations; or, if they prefer it, they may send them to you at the Society of Arts, &c.; the names of those who send such statements will be either given or suppressed as may be requested.

I will recapitulate nearly in the words of my former communication, several particulars on which information is wanted. It would, for instance, be desirable to have the nature of the soil and under strata described, on which plantations have been made; its value per acre; the mode in which it was prepared for planting; the sorts of trees planted thereon, and which of them were found best suited thereto; the distances at which the trees were first planted; at what periods they were thinned, and how many cut out at each thinning; and their measure and value; the present height, distance, measure and value of the trees now growing on an acre; what distances are found most advantageous; also to what

proportion

proportion of their heights they should be pruned up, and the best and most expeditious mode of performing the operation.

Great loss is frequently sustained by omitting to thin plantations properly, and in due time, but I am not in possession of facts to calculate with accuracy what this loss may be; I will however venture to give a short statement of some calculations I have made, as to the loss that would now be sustained, by letting trees grow to a great age.

In Miller's Gardeners Dictichary, it is stated that in a fall of oak timber in Lord Bagot's woods, Mr. Marshall counted the rings of one tree, which was sound at the butt, and found the number to be about 200. Its bole was 22 feet long, and 108 inches in circumference in the middle. Its contents 110 feet, which at 2*s*. amounts to 11*l*. I think it was last year, that a fine sound oak-tree was cut down, between Shrewsbury and Oswestry in Shropshire, of 300 years of age, and sold by auction for 52*l*. 5*s*.—And under my direction, many oak trees were cut down, some years ago, that could not be less than 300, and some of them probably 400 years of age, and even more. In Hunter's Evelyn's Sylva, is given the circumference of 10 trees, not one of which was probably less than 500, and some of them probably 1000 years old.

Lord Bagot's tree of 200 years old, above-mentioned, would, at the present price of 3*s*. a foot, be worth 16*l*. 10*s*. Supposing that 3*s*. a foot should continue to be the price of oak-timber, for the next 200 years, we will enquire what sum might be raised by growing four oak-trees in succession, upon the same spot of ground, each tree to be cut down when 50 years of age, and that their boles should be of the same length as that of Lord Bagot's, viz. 22 feet.

I fix on fifty years of age, as being convenient for my calculation;

calculation; and nearly the most profitable period at which to cut down trees of 22 feet bole, which have grown at the medium rate of one inch in circumference, and 12 inches in height, annually.

After its 52nd year, *such* a *bole* ceases increasing, after the rate of 5 per cent. per annum*: but the whole tree, including the top part above the bole, may continue increasing after that rate until its 61st year †.

I do not fix on 50 years of age as being the most profitable age at which to cut down trees; probably 60 or 70 years of age would in some instances be preferable. Supposing an oak-tree has increased, as above-mentioned, its bole of 22 feet would, at 50 years of age, measure 39 inches in circumference at the middle, and one-fourth of this, namely $9\frac{3}{4}$ inches, squared and multiplied into 22 feet, its length gives 14 feet 6 inches for its contents, which at 3*s.* a foot, its present value amounts to 2*l.* 3*s.* 6*d.* Supposing 2*l.* 3*s.* 6*d.* to be the value of each of the four trees of 50 years of age, grown in succession upon the same spot of ground, in the period of 200 years, we will calculate to what the three first trees would amount, if their value was placed out at compound interest, for the respective terms of 150, of 100, and of 50 years.

£.	s.	d.		£.	s.	d.
2	3	6	Accumulating during 150 years, at 5 per cent. per annum compound interest, will amount to —	3,280	0	0
			Carry forward	3,280	0	0

* See Table 12 of a bole of 24 feet, in the 26th volume of the Society's Transactions, page 68.

† See my first Table in ditto, page 49.

Brought

£. s. d.		£. s. d.
	Brought forward	3,280 0 0
2 3 6	Accumulating as above for 100 years, would amount to —	286 0 0
2 3 6	Accumulating as above for 50 years, would amount to —	24 0 0
	Add the value of the tree to be cut down at the end of 200 years	2 3 6
	Total amount in 200 years —	3,592 3 6

And carrying forward this calculation, the total amount of the produce in 300 years, would amount to £. 472,408 0 0

In former times, when the value of oak-woods were estimated by the number of hogs their acorns would fatten, the great age of trees would be of small consideration; but in the present times, I am persuaded, that if gentlemen who have many trees standing of the age of 150 years and upwards, would give this subject its due consideration, they will be aware of the immense loss to which they are voluntarily subjecting themselves—And this great loss is much to be regretted, in a political point of view, especially as the produce of this island is insufficient for its necessary consumption.

My motives for troubling you with this hasty production are, to promote the good of the public, by endeavouring to persuade gentlemen to bring forward well ascertained facts, respecting the most profitable management of growing timber trees, and to induce them to investigate, with accuracy, this very curious and important subject. If you think it is likely to have those effects, I shall thank you to

lay

lay this paper before the Society of Arts, &c. for their consideration.

I am, Sir,

Your obedient servant,

CHARLES WAISTELL,

No. 99, High Holborn,
Oct. 1809.

To C. TAYLOR, M. D. SEC.

PAPERS

IN

CHEMISTRY.

The GOLD MEDAL *of the Society was this Session voted to Mr.* J. P. HUBBARD, *Picket-street, Temple-Bar, for Specimens of British Marble, produced from the Babicomb Quarry, near Teignmouth in Devonshire. The following Communications were received from him, and Sixty beautiful Samples are fixed up in the Great Room of the Society.*

SIR,

AGREEABLY to the wishes of the Society, expressed in their list of Premiums, stating that they were desirous to encourage the marble of the quarries of this country, I herewith send fifty various specimens, all arising from one quarry, named the Babicomb quarry, in my possession, situated in the parish of St. Mary Church, near Teignmouth, in the county of Devon, and adjoining the sea. I beg leave to observe, that though an attempt to introduce this article has once before failed, yet I am confident, that if I should be so fortunate as to have my exertions seconded in such a way as the nature of the concern requires, a considerable benefit

would ultimately result to the country at large, as well as to myself. The numberless obstacles which I had to encounter, during a period of two years, arising from heavy expenses, and local prejudices, must have damped my exertions, if I had not resolved at the onset to give it a decided trial. Perhaps no period could have offered so eligible as this, for the advantage of the enterprize, owing to the present enormous prices of foreign marble. I am sorry to see, daily, many unaccountable prejudices arise against most articles of the produce of our own country; but I hope time will remove them. It would be presumption in me to attempt to vie with the finer articles of continental production in this line, but it cannot be denied, that the application of the marbles now produced will be useful, economical, ornamental, and worthy of encouragement. The advantages which would arise to the country at large from a general introduction of this article are very evident, and if I can be favoured with the patronage and support of the Society of Arts, &c. towards accomplishing such object, they would meet with the warmest acknowledgments of many individuals besides myself.

I have already prepared a great variety of articles, such as chimney-pieces, slabs, &c. of very large dimensions, of these marbles, which are now ready for inspection, and which will show that I have entered into this business on an extensive scale.

I subscribe myself with great respect,

Sir,

Your obedient servant,

JOHN P. HUBBARD.

12, *Picket-street, Temple-bar,*
March 1*st*, 1809.

To C. TAYLOR, M. D. SEC.

The

THE specimens of marble sent by Mr. Hubbard to the Society were each of them eight inches high, six inches broad, and one inch thick, and polished on one face; such are the dimensions pointed out by the advertisement of the Society, in order that a regular range of British marbles may be fixed round the Society's Great Room, to show to the public what our quarries can produce. Mr. Hubbard's marbles were, on being received, referred to the consideration of their Committee of Chemistry, and the following additional information obtained respecting the quarry and produce thereof, viz.—

That the quarry which produced the different specimens is twelve acres in extent.

That marble similar to each specimen can be distinctly procured.

That Mr. Hubbard had then in his possession columns of red marble, eight feet long, and two feet diameter, and believed that they might be got ten feet long, and five feet diameter, and that blocks of other kinds might be got of large sizes.

That he had at that time slabs six feet six inches long, by three feet six inches in width.

That the quarry is close to the sea, and a part thereof covered by it at high water, and that he can load vessels direct from the quarry, having made a wharf for that purpose.

That the quarry is situated about four miles from Teignmouth, and was first opened about sixteen years ago, and was afterwards neglected, but that it has been now worked by him for two years.

That the marble is harder in quality as the mine goes deeper, and that some part of it rises fifty feet from the sea.

That the sale price is about half that of foreign marble of similar appearance; that the general price is now about four shillings per superficial foot, and will probably be so reduced as to be delivered at three shillings in London.

That it will take a finer polish than any other marble found in the kingdom.

That he supposes from sixty to one hundred workmen may be employed in the quarry next autumn.

That chimney-pieces made from this marble are not injured from the heat of fire applied near to them, nor liable to crack from alternate sudden changes of heat and cold.

That great part of the refuse stones of the quarry will burn to lime, and that such lime is of superior quality to any other on that coast.

The Society having taken into consideration the circumstance of Mr. Hubbard's having carried their views to so great an extent, and of his undertaking being likely to prove highly advantageous to this country, voted to him their Gold Medal, although no specific premium had been ever offered by them for coloured British Marbles.

Mr. Hubbard afterwards presented the Society with ten more specimens from his quarry, which with two specimens of Devonshire marble presented by Lord Clifford, and two others presented by Mr. W. Coles, have been framed along the surbase of the Society's Great Room; where it is also intended to place such other marbles, the produce of the British empire, as may be presented to them, with references to each sample, that the public may know from whence each kind can be procured.

The SILVER MEDAL *of the Society was this Session voted to Mr.* R. PORRETT, *Jun. of the Tower, for the following Communication of Experiments and Observations made by him on the Prussic and Prussous Acids.*

SIR,

I TAKE the liberty of offering to the Society of Arts, Manufactures, and Commerce, a Memoir on the Prussic Acid, detailing some experiments, by which I have attempted to prove that oxygen is one of its principles, and giving an account of a new acid which I have been fortunate enough to discover.

I have the honour to be,

Sir,

Your most obedient,

Humble servant,

R. PORRETT, JUN.

Tower, 21*st April*, 1809.

To C. TAYLOR, M.D. SEC.

Memoir on the Prussic Acid.

CONSIDERABLE differences of opinion exists among the most celebrated chemists respecting the composition of

the prussic acid, some agreeing with Fourcroy and Vauquelin that oxigen is one of its component parts, and others with Berthollet and Proust, who dispute its presence. Mr. Proust, in his history of the Prussiates, asserts, "That "there is no fact that indicates oxigen to make a part of "this acid, and that from the well-known affinities of its "three elements, added to the circumstances under which "it is formed, it can scarcely be thought that it does." This difference of opinion implies a want of some decisive experiments, which may set the question for ever at rest, and those which I am going to relate I am induced to think are of that description.

Some time back, I proposed to myself the discovery of a method of preparing a triple prussiate of potash, in a pure state, which should be free from the objections to which the processes in general use are subject. In reflecting on the means most likely to attain this end, it occurred to me, that I should succeed if I decomposed prussiate of iron by double elective attraction rather than by single, employing, instead of a pure potash, that alkali, in combination with a substance uniting the properties of solubility when combined with potash, strong attraction for oxide of iron, and insolubility when united to that oxide. The only substances I could think of possessing all these requisite properties were the succinic acid and sulphur; as the high price of the former precluded its use for this purpose, I determined to employ the latter. I therefore took one ounce of dry sulphuret of potash, and one ounce and a half of the best prussian blue, previously well washed and powdered, and put them into a Florence flask, two thirds filled with distilled water; a disengagement of sulphuretted hydrogen, of ammonia, and of caloric immediately took

place

place. The materials were boiled slowly together for three hours, occasionally replacing the water which evaporated. The whole was then thrown on a filter; what remained on the filter was black, and consisted of sulphuret of iron, and undecomposed prussiate of iron. The liquid that passed through, I found on trial to consist of triple prussiate of potash, and hydroguretted sulphuret of potash. In order to complete the decomposition of the latter, I boiled the liquid again, for the same time as before, with another half ounce of prussian blue, and when cold filtered it. The filtered liquid (A) was now nearly colourless, and free from hydroguretted sulphuret. On pouring a little of it into a solution of oxy-sulphate of iron, I was very much surprised to find that solution changed to a deep blood-red colour, without any precipitate ensuing, instead of forming with it a precipitate of blue prussiate of iron. So unexpected a phenomenon determined me to undertake an examination of this liquid; with this view I subjected it to the action of the chemical agents mentioned in the following table.

Table I. with Liquid A.

CHEMICAL AGENTS.	EFFECTS.
Paper stained with turmeric	No change of colour.
Paper stained with litmus.	Do. Do.
Potash - -	No disengagement of ammonia, nor any apparent change.
Lime - -	Do. Do.
Diluted sulphuric acid	An expulsion of sulphurous acid, the liquid becomes slightly opalescent.
Nitric acid (pure) -	The acid assumes a red colour, but this effect is not permanent.
Oxy-muriatic acid -	This acid loses its smell.
Muriatic acid (pure) -	No change.
Muriate barytes -	A white precipitate.
Tincture of galls -	No change.
Nitro-muriate platina	A heavy brilliant ochre, yellow precipitate.
Muriate gold -	Dark olive brown precipitate
Nitrate silver -	A precipitate at first white, but quickly passing to yellow, red, and lastly to brown.
Sulphate silver -	A dull white or stone coloured precipitate.
Oxy-nitrate mercury -	A white precipitate
Oxy-nitrate lead -	A white precipitate.
Super-sulphate copper	A dull white precipitate.
Muriate bismuth -	No precipitate.
Sulphate iron -	No change.
Oxy-sulphate iron -	The solution assumes a deep blood-red colour. No precipitate.

The effects of the sulphuric acid and of the muriate barytes clearly proved the existence of sulphite of potash in the liquid, while that of the oxy-sulphate of iron indicated the presence of some other principle to which the liquid was indebted for its peculiar characters, the separation of this principle in a pure state became therefore a necessary preliminary operation to its examination; after a few trials I succeeded in effecting this separation. The following is the process I employed.

The liquid was evaporated by a gentle heat to dryness; upon the saline residuum alcohol was poured till it ceased to extract any thing; by this means the whole of the sulphite and sulphate of potash was left behind, and the alcohol when filtered held in solution that part only which had the red tinging property with solutions of iron. The alcohol was now got rid of by distillation, and the salt it left in the retort was redissolved in water. This solution (B) gave the following results with the different metallic solutions.

TABLE II. with Liquid B.

METALLIC SOLUTIONS.	EFFECTS.
Nitro muriate platina -	A precipitate similar to that in Table I. but in a smaller quantity and longer in forming.
Muriate gold - -	Light olive precipitate, some gold reduced.
Nitrate silver - -	A grayish white precipitate, not changing colour.
Sulphate silver - -	A clear white precipitate.
Nitrate mercury -	A copious white precipitate.
Oxy nitrate mercury -	A white precipitate in small quantity.
Nitrate lead - -	No precipitate.
Oxy nitrate lead -	No precipitate.
Super acetate lead - -	No precipitate.
Hyper oxy muriate lead	A slight white precipitate.
Super sulphate copper	A dull white precipitate.
Muriate tin - -	No precipitate.
Muriate bismuth -	No precipitate.
Sulphate iron - -	No change.
Oxy sulphate iron -	Same as Table I.
Oxy sulphate manganese	The crimson colour disappears; no precipitate.
Sulphate zinc - -	No change.
Nitro muriate cobalt -	No precipitate.
Nitrate nickel - -	No change.

It is necessary to remark, that in the preceding Table, as well as in Table I. several of the nitrates and muriates were slightly reddened, though not in a degree to be compared with the oxy-sulphate of iron. I have not noticed this in the table, because I am not certain whether this effect was not owing to a minute portion of oxide of iron which might have

have been introduced into those solutions by the acids employed to make them, as both the nitric and muriatic acids of commerce generally contain some; an excess of nitric acid, even if pure, might also cause this effect, as Table I. may convince us. The solutions with which this effect occurred to me were those of bismuth, silver, mercury, lead, cobalt, gold, and platina.

The liquid B is not altered by exposure to the air.

Its effect on oxy sulphate of iron is the same, whether this sulphate is neutral, or contains an excess of acid, or is supersaturated with carbonate of ammonia.

Sulphuric acid destroys the colour produced on oxy sulphate of iron, provided the three liquids are in a concentrated state. If there is much water present, no change ensues.

Having obtained the tinging principle B, separate from the other salts with which it was contaminated, I asked myself to what was its formation and the simultaneous disappearance of the prussic acid, during the second ebullition, owing? I could imagine but five causes for this that were likely to have been efficient, concerning each of which I made a question to be resolved by experiment, viz.

Question I. Was it owing to the complete separation of the oxide of iron from the triple of prussiate by the sulphur, and the subsequent decomposition of the simple prussiate by the heat of ebullition long continued?

Question II. Was it owing to the action of the sulphurous acid produced?

Question

Question III. Was it owing to the action of the sulphuretted hydrogen?

Question IV. Was it owing to a combination of the prussiate of potash and sulphur?

Question V. Was it owing to the de-oxidation of the prussic acid, by the hydroguretted sulphuret?

To answer the first question, it is only necessary to attend to the results afforded by long-continued boiling of the simple prussiate of potash. I shall state these results as I find them recorded by Professor Proust.

They are carbonate of ammonia, carbonate of potash, and some simple prussiate that escapes decomposition, even after four or five successive distillations; there is, therefore, no analogy between the products of this experiment and the liquid A, for had the latter contained carbonate of potash, it must have changed turmeric paper brown; had it contained carbonate of ammonia, it must have done the same, and likewise have given out ammoniacal gas when potash and lime were added; it must also have turned blue the solution of copper; and had it contained prussiate of potash, it must have produced prussiate of iron when added to the green sulphate of that metal: it will be seen by referring to Table I. that none of these effects were produced. Were further evidence necessary of the dissimilarity of the two liquids, it might be mentioned that Professor Proust poured alcohol on the saline residuum of his distillation of the prussiate, which took up a part that he found to be prussiate of potash; had any of the tinging salt B been present, the alcohol must have dissolved that likewise, and it could not have escaped his observation.

observation. We have, therefore, ample grounds for negativing the first question.

In order to answer the second question, I passed sulphurous acid gas for a long time through a solution of triple prussiate of potash; the prussic acid was expelled, and sulphite of potash formed; but this sulphite was not mixed with any tinging salt. On the supposition that the disappearance of the prussic acid, in the liquid A, might have been owing to its having been expelled entirely by the sulphurous acid, and that the tinging liquid resulted from the mutual action of the other principles, namely, the oxide of iron and hydroguretted sulphuret of potash: I subjected a mixture of these materials to long boiling, but could not by this means produce a liquid that tinted oxy-sulphate of iron red. Sulphurous acid gas, passed through water in which Prussian blue was diffused, did not in the least affect that compound. These experiments completely refute the opinion on which the second question was grounded.

To enable me to reply to the third question, I passed sulphuretted hydrogen gas for several hours through a solution of triple prussiate of potash, on which it was found to have no effect.

We shall be little disposed to allow that there is any foundation for the fourth question, when we consider the circumstances of the last-mentioned experiment, in which sulphur in the state of the most minute division was offered to the triple prussiate, without any combination ensuing; and also when we compare the effects of the metallic solutions in Table II. with those which would ensue with liquids containing sulphur. But, if any doubt should still be entertained on this subject, the following experiment will perhaps remove it: Into a solution of prussiate of mercury throw

some

some pieces of phosphuret of lime, the oxide of mercury of this prussiate will thus be reduced and separated from the liquid which is to be filtered; some of this liquid poured into carbonate of iron turns it red, the red colour soon disappears, and a white precipitate begins to form; this white precipitate soon changes to green, and if a little nitric or oxy-muriatic acid be now poured upon it, it becomes a perfect blue prussiate of iron. This experiment, in which a liquid turning a solution of iron red was produced without the employment of a particle of sulphur, goes very far to negative our fourth question; and when considered in conjunction with the preceding ones, we can hardly do otherwise than dissent from the supposition which gave rise to that question.

But if the experiment last adduced tends to refute the fourth question, it very strongly supports the fifth; for the changes of colour observable were undoubtedly owing to successive stages of oxidation by the contact of the atmosphere. In confirmation of this question, it may likewise be asserted, that the long boiling with the hidroguretted sulphuret is a powerful de-oxidating process. But it will be said to me, if it is really true that the prussic acid has been de-oxidated by this process, you ought to be able to recompose that acid from the solution B by oxidation. This struck me very forcibly; and being anxious to give this last proof of the truth of my deductions, I attempted the recomposition of this acid by several oxidating processes for some time without success: I had at last, however, the particular satisfaction of succeeding completely by the agency of nascent hyper-oxymuriatic acid. The method I employed was the following:

A little hyper-oxymuriate of potash was put into the bottom of a glass tube. Over this some of the liquid B mixed with

with a few drops of diluted sulphuric acid was poured. The heat of a candle was then applied to the bottom of the tube, and as soon as a violent action commenced, the heat was withdrawn: by this process the prussic acid was reproduced, and was proved beyond the possibility of a doubt by the formation of blue prussiate of iron, when poured into a mixture of green and red sulphate of that metal. Blue prussiate may also be produced at once, by substituting for the diluted sulphuric acid, a solution of green sulphate of iron, with excess of acid.

Having thus succeeded in proving that the tinging principle of the liquid B was sub-oxidised prussic acid, my next object was to obtain that principle in a free state, for we must recollect that we have hitherto considered it only in combination with potash, with which it formed a neutral salt; this circumstance gave me reason for supposing it an acid, and I therefore determined to attempt its separation by abstracting its base by a stronger acid. The following was the process I employed for the purpose.

The liquid B was evaporated nearly to dryness, and put into a retort with diluted sulphuric acid, a receiver was then adapted to it, and about two-thirds of the liquid distilled over by a gentle heat; what remained in the retort was sulphate of potash. The receiver contained a colourless liquid, with a faint, sour, disagreeable smell, and a decided acid taste. This liquor I have named in conformity with the principles of the new nomenclature, *prussous acid*, and its salts *prussites*, of which the liquid B contained one in solution, namely the prussite of pot ash.

The effects of the prussous acid on the earthy and metallic solutions, as far as I have tried them, are noted in the following table.

Table III. with Prussous Acid.

CHEMICAL AGENTS.	EFFECTS.
Muriate lime	No change.
Muriate barytes	No change.
Muriate gold	The gold precipitated metallic.
Sulphate silver	Copious white precipitates.
Nitrate silver	
Prussiate mercury	No change.
Nitrate mercury	Copious grayish white precipitate.
Oxy nitrate mercury	Very slight precipitate white.
Oxy sulphate iron	Solution turns blood-red, no precipitate.
Nitro muriate platina	No precipitate.
Nitrate lead	No change.
Oxy nitrate lead	Solution becomes red, but hardly any precipitate formed, unless heated, in which case a copious white precipitate ensues. The red colour disappears, a rapid action takes place between the two liquids, and some of the nitric acid of the solution is decomposed.
Hyper oxy muriate lead	A slight precipitate, probably of muriate of lead.
Super sulphate copper	Solution becomes slightly turbid.
Muriate bismuth	No precipitates.
Nitrate nickel	
Muriate tin	
Nitrate cobalt	
Sulphate iron	
Sulphate manganese	
Sulphate zinc	

I cannot conclude this part of my memoir without giving a more simple and expeditious process for preparing prussite of

of potash, than that which I at first discovered. It is the following:

Pour a solution of prussiate of mercury into hydroguretted sulphuret of potash, till the mutual decomposition of the two liquids is completed; prussite of potash is instantly formed, and may be separated by filtration from the solid combination of the sulphur and mercury.

I wish also to observe, that the proportion of Prussian blue I have mentioned for boiling with the sulphuret is much larger than is necessary, as I have since succeeded in obtaining prussite of potash when the proportion of Prussian blue was only equal to that of the sulpheret, but long boiled with the latter in two distinct and equal portions. The prussite of potash thus obtained is, however, mixed with a much larger quantity of hydroguretted sulphuret than when a greater portion of Prussian blue is employed.

Whether the prussous acid can be applied to any use, time and future experiments must decide. It appears to me to be a very delicate test of silver and of iron in solution.

The preceding experiments, by proving the presence of oxygen in prussic acid, give it a stronger claim than it before possessed for being placed among the acids.

The prussous acid possessing stronger acid properties than the prussic is a curious, though not a solitary, instance of the effect of oxygen in diminishing acidity, when its quantity exceeds a certain fixed proportion; in this respect the prussic acid is analagous to the oxy-muriatic.

To recur to the attempt which gave rise to the researches that are the subject of this memoir, I beg leave to state, that I have succeeded in producing pure triple prussiate of potash, by stopping the process before the change which produced the prussite ensued, and by subsequent purification of the lixivium from sulphates and sulphites, by acetate of

barytes; from sulphur by acetate of lead; and, lastly, from the acetate of potash thus formed by chrystallization; but on account of the complication of this process, I hesitate to recommend it for general use.

ROBERT PORRETT, JUN.

Tower, London, April 21, 1809.

SIR,

WISHING to give every information tending to ensure success to those persons who may be inclined to repeat my experiments, I am induced to request the Society to allow the enclosed Paper to be considered as a Supplementary Note or Memorandum to the Memoir on the Prussic Acid, which I had the honour to submit to their notice.

I remain, very respectfully,

Sir,

Your most obedient humble servant,

R. PORRETT, JUN.

Tower, May 8, 1809.

To C. TAYLOR, M. D. SEC.

IT is essential to the success of the experiment, in which the prussic acid is regenerated from the liquid B by the nascent hyper-oxygenised muriatic acid, that the excess of acid

acid remaining in the liquid, after the oxygenising process, should be neutralized by an alcali previous to pouring it into the solution of iron, which should likewise be perfectly neutral.

ROBERT PORRETT, JUN.

May 8, 1809.

Certificate in favour of Mr. Porrett's Prussic Acid.

GENTLEMEN,

I BEG to state that I have repeated the greater part of the experiments related in Mr. R. Porrett's Memoir on the Prussic Acid, and find them correct. I have no hesitation in saying the discovery of the new acid is a source of merit to himself and utility to science.

I am, Gentlemen,

Your humble servant,

JOHN DUNSTON.

Old Broad-Street, May 6, 1809.

To the MEMBERS of the Society for the Encouragement of Arts, Manufactures, and Commerce.

The THANKS *of the Society were this Session voted to Mr.* WILLIAM SALISBURY, *of the Botanic Gardens at Sloane Street and Brompton, for the following Communication on the Culture and superior Colouring Qualities of Madder raised by him from Seeds presented to the Society by J. Spencer Smith, L. L. D. who procured them from Smyrna. Samples of the Seed received from Mr. J. S. Smith are preserved in the Society's Repository, also the coloured Liquors referred to by Mr. Salisbury.*

SIR,

I HEREWITH send you two samples of extract of Madder, one of which marked A is produced from the root of the Smyrna kind, a plant which I have not heard of being before introduced into this kingdom, the seeds of which I received from you, and which you informed me had been procured at the request of the Society of Arts, &c. from Smyrna, by J. Spencer Smith, Esq. I sowed the seeds in my Botanic Garden, at Cadogan-place, in April 1808, in a soil rather inclining to clay, and I have the satisfaction to find, from this experiment, that there is every appearance of its being cultivated with considerable success; for if I might venture to state a calculation made of the crop from the small quantity grown, the produce would be upwards of fifteen hundred weight of the fresh root per acre.

The above estimate is made on the supposition that the seeds were sown in drills at one foot distant from each other, which appears to me to be the best mode for its cultivation.

I am

I am thus particular, as I conceive I shall be doing my country a service, if it will induce any person to attempt the culture of this madder on a larger scale. I beg leave to observe, that the first attention which I paid to this valuable vegetable, after I had raised it from the seed, was to ascertain satisfactorily whether the superior quality of its colouring matter depended on the plant itself, or if it was merely owing to climate, or other local circumstances, which often occasion a great difference in the quality and value of many other productions of a similar nature; to prove this I had extracts made in the same manner with the prepared Dutch madder of our shops, which did not bear any comparison in point of colour with that of mine; but fearing that the Dutch madder might be damaged by the mixture of some extraneous substance, I made a similar extract from the fresh roots of the common rubia tinctorum, which had for some years past been growing in my garden at Brompton, and the extract marked B is the result, and is much inferior in colour to that from the Smyrna seed; though the extracts were both obtained in the same way, viz. by boiling the roots and making a precipitate from them by allum and vegetable alcali.

I flatter myself I have here been instrumental in the introduction of a plant, producing a very valuable dye, and hope we may not be long under the necessity of depending upon a foreign market. If any gentleman would wish to make experiments relative to its growth, or if any seeds of a similar nature should come into the Society's possession, I shall be happy to make experiments with them, having appropriated a piece of ground in my new botanic garden solely for such purposes. I must confess, that I have great pleasure in the above communication, as it will prove that benefits occur from botanical institutions, and that the opi-

nion formed by some persons, that the study of botany is a dry nomenclature, is founded in error, for certainly much good will arise from botanical investigations to Medicine, the Arts, and Manufactures.

I am with great respect,

Sir,

Your obedient and humble servant,

W. SALISBURY.

Brompton, April 26, 1809.

To C. Taylor, M. D. Sec.

Dear Sir,

In answer to your further enquiries respecting the madder procured from the Smyrna seed, I beg leave to observe, that with regard to the management of the seed, I found it to succeed extremely well in drills in the open ground. I also tried some in a hot-bed, which also succeeded perfectly well, but the old seed, some of which I had from you this spring, will not grow. I consider it to be a variety of the common rubia tinctorum, but of a more robust growth, and superior in colouring matter. These plants thrive exceedingly in my new botanic garden in Sloane-street, and I flatter myself that I have been instrumental in introducing an article which gives to cotton the most beautiful and permanent red colour in existence.

Many former attempts to cultivate madder in England have failed, I understand, on account of the calico-printers formerly requiring it in a powdry state, but since the establishment in this kingdom of the Adrianople or Turkey red dye upon cotton, some thousand tons in weight of madder roots

from

from the Levant, are annually used in Great Britain for dyeing that colour, and for which use this kind of madder in the fresh root will be found superior.

I am informed that by the application of the Society of Arts, &c. to Government, madder roots grown in England are exempted from tithes.

I have every reason to believe, that for use in painting much finer colours than the present may be obtained from the roots of this plant by spirituous or acetous extracts, but I forbear at present further experiments, in order to increase as much as possible my remaining stock of plants; and this appears necessary, as I find the seed I had left will not vegetate this spring, and I apprehend that such seed as may now remain in the Society's possession will be useless.

I shall therefore proceed to increase my present stock of the plants from offsets and cuttings of the roots. If the above account is found deserving of the Society's attention, it is much at their service, and they shall be welcome to some of the roots when I have further propagated them. They blossomed abundantly, but did not produce seed, a circumstance which I observed also in the common kind growing near it: I have therefore endeavoured to increase it by other means, which may be done to any extent, but being now particularly engaged, the means I employ must be a subject of future communication.

I am, with great respect,

Dear Sir,

Your's very truly,

WILLIAM SALISBURY.

Botanic Garden, Brompton,
Nov. 16, 1809.

To C. Taylor, M. D. Sec.

PAPER

IN

POLITE ARTS.

The SILVER MEDAL *and* FIFTEEN GUINEAS *were this Session voted to Mr.* ROBERT BAUGH, *of Llanymynech, in Shropshire, for a Map of that County. The following Communications were received respecting it.*

SIR,

I SEND you a map of Shropshire, and request you to lay it before the Society, in the hope of obtaining a bounty for the ingenious artist who is the author of it, in case it should meet with the approbation of the Society. It has been transmitted to me by a friend of mine in that county, Mr. Hunt, of Boreatton, who assures me that it is a new survey, made at a considerable expense, with much attention; and that it has been inspected and approved by many gentlemen

and

and other intelligent inhabitants of the county, who have given their countenance and assistance to the very able surveyor, Mr. Baugh.

I am, Sir,

Your obedient servant,

THOMAS PITT.

Wimpole-Street, March 28. 1808.

To C. Taylor, M. D. Sec.

SIR,

Mr. Baugh, the surveyor, and author of the Map of Shropshire, is now with me, and has brought his map and assistant engraver. It has now had a proper printer, and he has put in the suitable ornaments and other accompaniments adapted to the work; and it appears to me both correct and also very diligently attended to. Most of the noblemen and principal gentry of the county have been consulted. Several gentlemen and clergy, judges of the arts, and also men of various attainments in topographical and other points of knowledge, have lent their assistance; I doubt not, therefore, it will meet with the approbation of our Society.

He informs me he feels it an indispensable duty to publish it this summer. I have, therefore, instructed him to submit the first published copy to the Society, and this letter will accompany it.

I remain, Sir,

Your very obedient servant,

ROWLAND HUNT.

Boreatton, July 24, 1808.

To C. Taylor, M. D. Sec.

SIR,

SIR,

I HAVE taken the liberty of sending you my map of Shropshire, hoping for the honour of the approbation of the Society; and as the work has been performed at a very considerable expense, I also hope that I shall be deemed worthy of obtaining a bounty for it.

I am, Sir,

Your most obedient and humble servant,

ROBERT BAUGH.

To C. TAYLOR, M. D. SEC.

Certificates in favour of Mr. Baugh's Map.

March 6, 1809.

WE hereby certify that the nine sheet Map of Shropshire, dedicated to the Right Hon. Earl of POWIS, and lately published by ROBERT BAUGH, land surveyor and engraver, is from an actual survey by JOHN FURNIVAL, begun in the year 1803, and we believe the same to be accurate and correct.

—— BRADFORD,
ROWLAND HUNT,
EDWARD T. STEWARD,
JOHN HILL,
JOHN HILL, JUN.
JAMES MARSTON,
JOSHUA GILPIN,
THOMAS EYTON,
JOHN EYTON,
THOMAS KYNNERSLEY,
W. CORSER,
JOHN DODSON,
E. WILLIAMS, JUN.
SIR J. T. EDWARDS, BART.
JOSEPH CORBETT,
JOSEPH LOXDALE,

R. W.

R. W. Darwin,
William Tayleur, Jun.
D. Parkes,
C. Dallas,
Robert Baugh,
James Donne,
Thomas N. Parker,
J. Owen,
W. E. Doraston,
Thomas Yates,
G. Howell,
Thomas Telford,
Ch. Williams Wynn,
W. W. Wynn,
John B. Powell.

PAPERS

IN

MANUFACTURES.

The SILVER MEDAL *set in a broad Gold Border was this Session voted to the Patrons and Committee of the Flag Association, for a matchless Specimen of double Brocade Weaving in a Flag, now executing at No.* 17, *Gun-street, Union-street, Spital Fields. The following Communication was received from them.*

MY LORDS AND GENTLEMEN,

IT having been represented to many of the nobility and gentry of this country, that the Spitalfield's weavers are not able to manufacture silk goods equal to foreigners, and in consequence of such an idea, many wrought goods having been smuggled into this country to the great injury of the silk weavers; a subscription has been opened by them, for the

the purpose of raising a sum of money to weave a flag, as a proof of their ability, superior to any thing ever yet executed in this or any other country, and of which a description is annexed. This great undertaking has at much pains and expense been actually commenced, and is now in a state of forwardness; and the Silk Weavers being sensible that you are the patrons and encouragers of British Arts and Manufactures, take the earliest opportunity of requesting you will condescend to view this great and novel work in the loom, and if it meets with your approbation and encouragement, it will give them great pleasure.

Signed in behalf of the Silk Weavers, by

THOMAS ATKINS, President.

Spital Fields, Sept. 2, 1808.

To the Society instituted at London for the Encouragement of Arts, Manufactures, and Commerce.

Description of the Flag now in the Loom.

Its dimensions are two yards wide, the ground a rich crimson satin on both sides, and brocaded on each side alike, with appropriate colours tastefully and elegantly shaded by the artist. Upon its surface will appear woven within an oval, a female figure emblematic of the art of weaving, reclining with pensive aspect on a remnant of brocade, lamenting the neglected state of this manufacture. A figure of Enterprize is represented in the generous act of raising her up, and reviving her drooping spirits, by showing her a cornucopia pouring forth its treasure, emblematical of the resources of this happy isle, and not unaptly indicating that the wealth and liberality of the British nation are ever ready

to

to support laudable undertakings, and particularly those intended for the relief of indigent merit. Close to that of Enterprize, and under a representation of the all-seeing eye of Divine Providence, the figure of Genius appears erect, pointing to a flag displaying *the Weavers' Arms*, placed upon the temple of Fame, seeming by her expressive countenance to say, "execute your arduous task, Britannia will reward your labours, and Fame inscribing them on her sacred edifice shall record the merits of this grand exertion to posterity."

The corners of the flag will be adorned with emblems of peace, industry, and commerce. An edging with a curious Egyptian border will exhibit a combination of figures and devices, emblematic of the design for which it was formed, and the whole will in an expressive manner show to the world this interesting fact, that under the auspices of Divine Providence, and cherished by the blessings of peace and commerce, the British artists, when fostered and protected, are inferior to none throughout the globe.

THE Society attended with pleasure to the request of the Silk Weavers, and appointed a committee to inspect this performance in the loom, who reported to the Society, that the specimen of weaving there exhibited to them was superior to any thing they had ever seen or heard of, and that it was well deserving of the attention and protection of the Society.

The Committee recommended to the Society, that their Silver Medal set in a broad gold border, and inscribed to the Patrons and Committee of the Flag Association, should be presented as a bounty to them, as a mark of encouragement for the great exertions they had made, and the many ingenious

genious improvements now shown in this valuable branch of weaving.

The Society agreed with their Committee in these resolutions, and the Medal so inscribed was delivered by the hands of his Grace the Duke of Norfolk, the President, on the 30th of May, 1809.

The work is proceeding in the loom, and such ladies or gentlemen as wish for admission to see it, may procure cards for the purpose from any one of the undermentioned persons.

PATRONS.

Mr. WILLIAM TITFORD, Manufacturer, 1, Union Street, Bishopsgate, Treasurer.

Mr. WILLIAM HALE, Manufacturer, 4, Wood Street, Spitalfields.

Mr. JOHN KINCAID, Manufacturer, 28, Spital Square.

Messrs. RACINE and JAQUES, Dyers, Hare Street, Bethnall Green.

COMMITTEE.

THOMAS ATKINS, Maiden Lane, Wood Street, Cheapside.

ELIAS FLETCHER, 9, Gun Street, Old Artillery Ground.

WILLIAM CARTER, 128, Brick Lane, Spitalfields.

ISAAC HOARE, 3, Farthing Street, Spitalfields.

JOSEPH BENSON, 30, Pelham Street, Spitalfields.

JOHN M'FARLIN, 6, Wilks Street, Spitalfields.

SAMUEL AGAMBAR, 37, Sclater Street, Bethnal Green.

JOHN LEMEREE, 21, Pelham Street, Mile-End New-Town.

JOHN

JOHN RANDALL, 35, Church Street, Mile-End New-Town.

RICHARD CLIFF, 10, King Edward Street, Mile-End New-Town.

Or SAMUEL SHOOL, 17, Gun Street, Union Street, Bishopsgate; where the FLAG is manufacturing, who attends visitors from twelve 'till three o'clock every Friday.

THOMAS FRANK, Weaver.

T. ATKINS, Jun. Pattern Drawer and Reeder.

THIRTY GUINEAS *were this Session voted to Mr.* THOMAS SADDINGTON, *of Monkwell-street, Falcon-square, for a Machine of his Invention, for Manufacturing Silk-covered Wire, and Thread covered with Silk. The following Communication was received from him, an Explanatory Engraving is annexed, and a working Model is preserved for Inspection in the Society's Repository.*

SIR,

No. 47, Wood-street, Cheapside.

I SHALL be much obliged to you to lay before the Society of Arts, &c. a machine of my invention for the purpose of covering Wire. Having had an opportunity of seeing the process commonly used for this article, which is made in long workshops or sheds, I formed the design of a machine for making the article in a small space of room, and having completed it to my satisfaction, I now take the liberty of producing it to the Society, in hopes it will meet their approbation. There are three very material inconveniences

attending the common mode of covering wire. First: The necessity of having workshops in general from twenty to forty yards long, consequently the purchase or rent of such premises in London must be very considerable to the manufacturer. Secondly: The disadvantage of having the wire cut into pieces of the length of the workshop, for the purpose of covering it. Thirdly: The irregularity of the work so made, unless performed by a very steady hand. All the above inconveniences are fully obviated in my present invention, as the machine may be worked in a small room, and the wire may be covered of an entire length of several thousand yards if required, with a certainty of its being regular throughout the work. Besides these advantages, it requires only one person to work it, whereas in the common mode two are absolutely necessary.

The wheels might be increased and arranged in such a manner as to cover several wires at the same time, by which a great deal of work would be expeditiously performed.

The wheels being of the shape of conical pullies, admit of the work being regulated to any number of revolutions of silk or cotton round the wire, in the covering as may be necessary. Their diameters are nearly as follow, viz. on the brass tube *b* are five grooves, from about three quarters of an inch to one and a half inch in diameter. On A two grooves twenty-two inches. On E three grooves from three quarters of an inch to two and a quarter. On F *i h* G and K from one and a half to nine inches. H from five and a quarter to nine inches. *g* from three quarters to four and a half inches, all consisting of six grooves each. *m* has four grooves, from one and a half to six inches. *l* four grooves and two ratchet wheels, all nine inches. The roller D, and two bobbins *n* and B, three inches. The flyer

b c d e f

Mr. Saddington's Machine, for covering Wire with Silk or Thread.

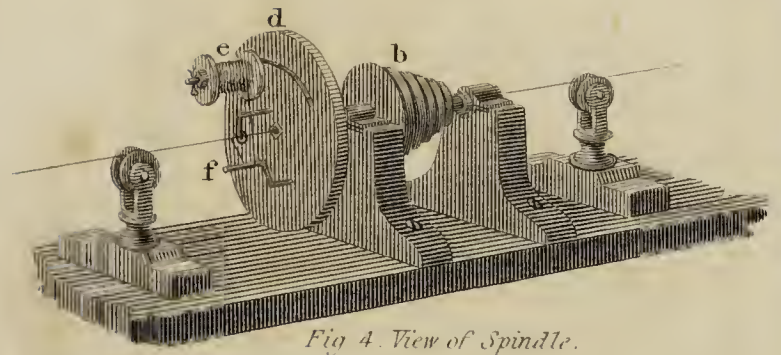
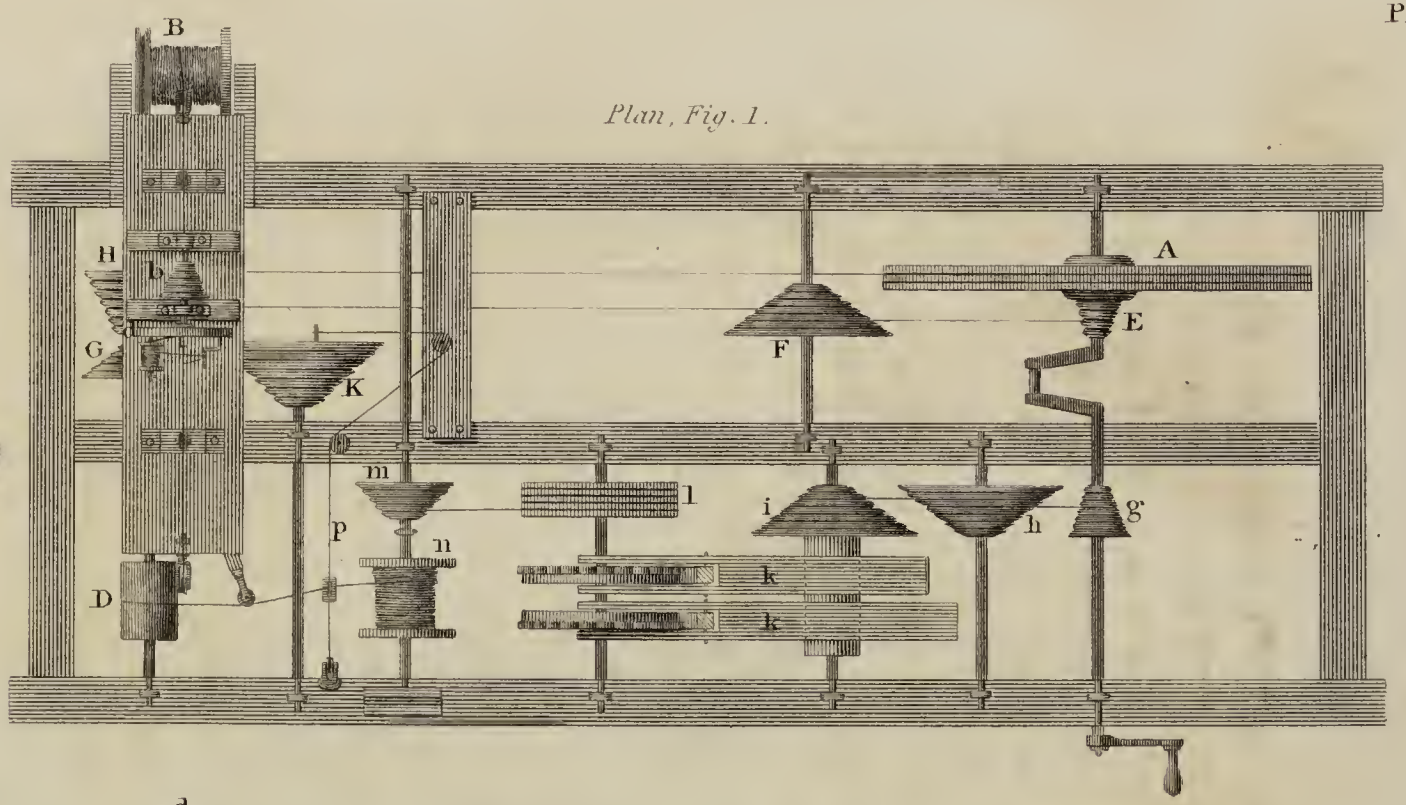
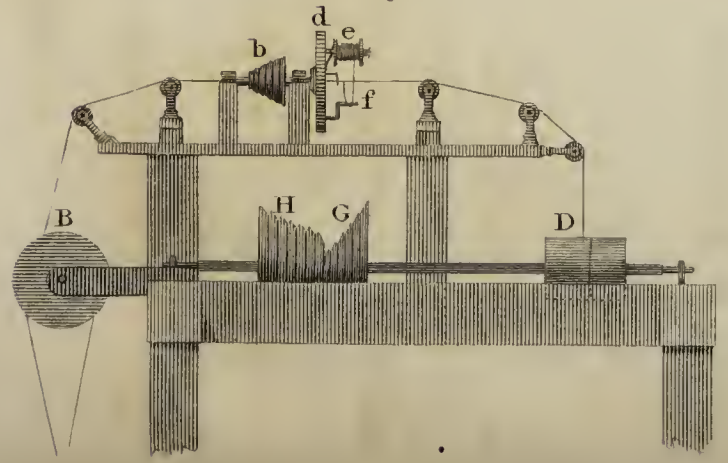


Fig 4. View of Spindle.

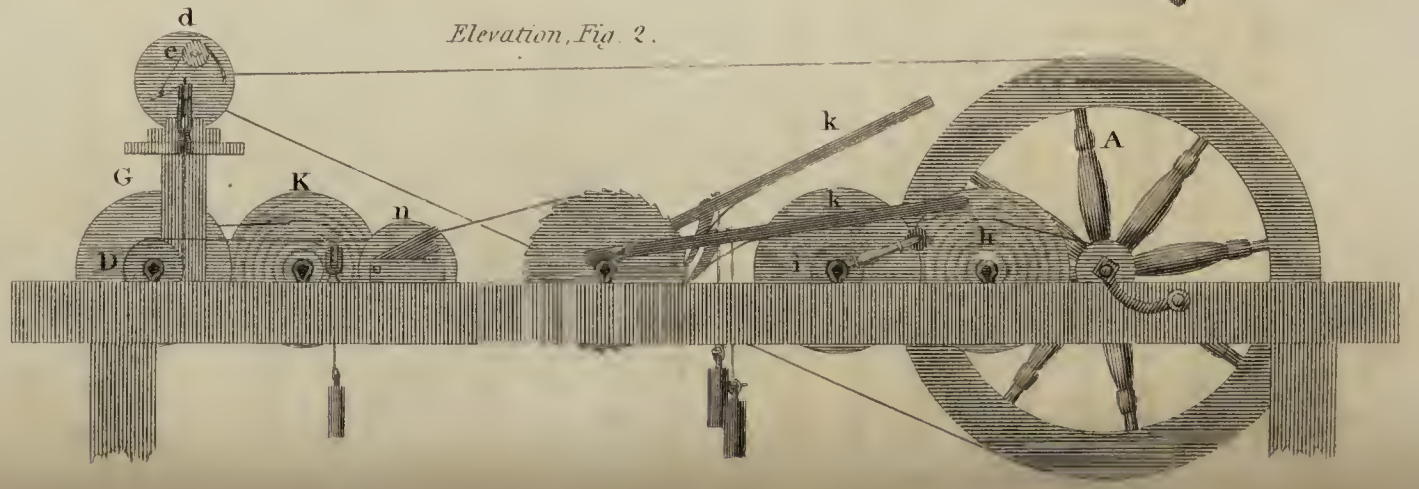
Plan, Fig. 1.



End View, Fig. 3.



Elevation, Fig. 2.



Drawn by J. Farey, Jun.r

b c d e f and roller D, receiving their motion from A and E, always move in proportion one to another, which causes the work to be of the same regularity. The roller D drawing over the raw wire from the bobbin B through the tube *b*, where it is covered, and passing round the roller, is taken up on the bobbin *n* by means of the ratchet wheels *l*. The wheels G and K are for regulating the wire winding on the bobbin *n*.

By placing the bands in the different grooves on the wheels *b* F and E, the covering of the wire is regulated to any degree at pleasure, as will be seen by the annexed table of the number of revolutions in one inch of covered wire. The smallest groove I call No. 1, the next size larger 2, and the largest 6.

Table for Regulating the Number of Revolutions in one Inch of Wire.

	b 1	2	3	4	5
6 H 1 F 6 F 1 E	153	120	99	86	76
6 H 1 F 5 F 1 E	132	103	85	75	66
6 H 1 F 6 F 2 E	105	82	68	59	52
6 H 1 F 5 F 2 E	90	70	58	51	45
6 H 1 F 6 F 3 E	81	63	52	46	40
6 H 1 F 4 F 2 E	75	58	48	42	37
6 H 1 F 5 F 3 E	72	56	46	40	36
6 H 1 F 4 F 3 E	57	44	37	32	28
6 H 1 F 3 F 3 E	45	35	29	25	22

EXAMPLE I.

Suppose the wire is wanted to be covered 76 revolutions in one inch, place the band on the wheel A, and on the largest or fifth groove on the tube *b*, then put the other bands on H 6, and F 1, and F 6, and E 1, it will be 76 revolutions,

as

as will be seen by the table. If the band on A and *b* 5 is removed to *b* 3, it will be 99. Again, if the band is removed to *b* 1, it will cover 153 revolutions in an inch.

Example II.

Place the bands on H 6 and F 1, and F 5, and E 2, and *b* 5, it will be 45 revolutions. Again, place the band on *b* 2, it will be 70 revolutions in one inch, and so on for any other at pleasure.

The manner in which the action of the lever is attached to the ratchet wheel in this machine is different to any thing I have seen before, and may be advantageously used in various branches of mechanics, where power with a rotatory motion is required, as it avoids the necessity of removing the lever from one hole to another round the axis or windlass. It might be usefully employed in raising the masts of barges, &c. or for the purpose of raising weights by acting as treddles. These hints I mention in hopes of leading to some mechanical improvements.

As I am not engaged or interested in making covered wire, I have shown the machine to gentlemen who are manufacturers of the article, and who have favoured me with their testimonies, approving of my invention.

I am Sir,

Your most obedient humble servant,

THOMAS SADDINGTON.

April 24, 1809.

To C. Taylor, M.D. Sec.

Description of Mr. Saddington's Machine for Covering Wire. Plate II. Fig. 1, 2, 3, *and* 4.

Plate II. describes Mr. Saddington's machine for covering wire. Fig. 1, is an horizontal plan of it. Fig. 2, an elevation taken sideways. Fig. 3, an elevation taken from one end, and fig. 4 is a perspective view of the tube or hollow spindle of the machine; the same letters and references are made use of in all the figures. The great wheel A, fig. 1 and 2, is turned round by the handle on the end of its axis, or by means of a threadle applied to a crank in the middle of its axis. The wheel hath two grooves in its circumference to receive a band of catgut, by means of which it gives a rapid rotative motion to the spindle shewn in fig. 4, and denoted by *b* in the other figures; the spindle is hollow, having a hole through it to receive the wire which is to be covered with silk or thread; a small circular board *d*, fig. 4, is fixed upon the end of the spindle, and turns round with it, it has a small pin projecting from its surface, upon which is fixed a bobbin *e*, having the thread or silk to cover the wire wound upon it; on the opposite side of the center of the board, a crooked piece of wire *f* projects from its surface; the silk from the bobbin passes over this wire, and is then wound upon the wire which is to be covered, and which passes through the hole in the spindle. It is plain that the motion of the spindle will lay the thread or silk evenly round the wire; it is necessary, at the same time, that the wire should be drawn through the spindle, this is done by means of a small pulley at *g*, on the axis of the main wheel, having six grooves, turning a larger wheel of 6 grooves *h*, which gives motion by a band to another band wheel *i*, of the same size; on the axis of this, two arms, one

of

of which is seen at *i* fig. 2, are fixed, which alternately move two levers *k k*, fitted on the axis of two ratchet wheels, whose teeth are caught by clicks with springs fixed to the levers; two small weights are hung from the levers, as seen in fig. 2, by which the ratchet wheels have a constant tendency to descend, and as the levers descend, they are raised up again by the arms fixed on the axis of the wheel. On the axis of the ratchet wheel a band wheel *l* is fixed, and by a band which goes round it, and one of the four grooves of the band wheel *m*, it turns the roller *n*, on which the wire is wound after being covered.

The wire which is to be covered is first wound upon a roller B, it then passes over two pulleys, and enters the spindle *b*, it is then covered with silk, &c. and is afterwards conducted over two other pulleys, and passes round a roller at D, and is then wound round the roller *n*, the roller D receives its motion from a band wheel E with three grooves, on the axis of the main wheel, these turn another band wheel F, having 6 grooves, which turns another G of 6 grooves, on the axis of the roller D; on the same spindle a band wheel H of five grooves is fixed, turning another K, which has a pin fixed in it acting as a crank, and drawing the catgut line *p* alternately backwards and forwards. This line has a ring in the middle of it, through which the covered wire passes, and by its motion it lays the wire evenly upon the roller *n*. This roller is fixed upon an axis, the end of which is received into a square socket, on the end of the spindle of the wheel *m*; this is contrived that the roller full of wire may be removed without disturbing the wheel *m*, the bearing of the end of its spindle is made in three pieces, viz. two outside ones fixed, and the middle one moving on a joint; the end of the spindle passes through a hole, and rests against the middle piece, but when this is

turned upon its joint, as shewn in fig. 2, the spindle may be drawn back so as to release it from the socket in the end of the axis in the wheel.

Certificates were received from Mr. WILLIAM WITHALL, of Wilson-street; Mr. GEORGE CROMWELL, of Newgate-street; Messrs. JOSEPH TURNER and Co. of Little Britain; and Mr. WILLIAM FARMER, of Wood-street, Cheapside; expressing their great approbation of Mr. Saddington's machine, the novelty of its principle, and the accuracy of its work.

PAPERS

IN

MECHANICS.

The GOLD MEDAL *of the Society was this Session voted to* JOHN MILLER, *Esq. of Bedford, for his Methods of Raising the Bodies of Persons who have sunk under Water, or of assisting Persons in Danger in Water. The following Communication was received from him; explanatory Engravings are annexed, and Models of the different Implements, with Drawings shewing their mode of Application, are preserved in the Society's Repository.*

SIR,

WITNESSING, as many others did, a boy losing his life in the river in this place, for want of an expeditious means of finding and recovering his body when sunk, I wrote to and waited on Dr. Hawes, requesting him to procure for me whatever were the proper and most approved machines for that purpose. He purchased for me two sets of the Royal Humane Society's Apparatus for Reanimation; two of Daniel's

Daniel's Life Preservers; one of the Society's Rope Drags; and one of Dr. Cogan's Pole-Drags; pointing out this last as the most approved and most efficacious machine then in use: and he gave me a sketch of a bar-drag, armed with tenter-hooks, and weighted with a bar of iron, to which the rope for drawing it was to be fastened.

As soon as I had received it, I went with a medical gentleman, who had been eye-witness to the fatal catastrophe, and who assisted in searching for and taking out the boy, (consequently knew the precise spot wherein he fell, and where he was found, which was within three feet of where he fell) to try the efficacy of Dr. Cogan's drag. The boy fell from off the bridge whilst fishing, and so far distant from the shore as to render a boat necessary for us to reach the spot. The depth of the water was ten feet, and we found a difficulty from the buoyancy of the pole in Dr. Cogan's drag, in forcing it to the bottom, and when we did, the stones, or whatever it met with, so favoured its buoyancy as to toss it up considerably when drawing forwards, and it required the force of both hands to keep it down so as to scrape the bottom with it. The result was, that the force the person holding the drag was obliged to use to counteract the buoyancy of its pole (added to the weight and resistance of the water against it) overpowered the means of the person who had the guidance of the boat, to move it in the direction he wished; and instead of the movement of the boat directing the drag (or rather the person holding it) the drag, by the force required to keep it at the bottom, and by the weight and resistance of the water acting on its pole, governed the boat, and was as it were an anchor to it, confining the efforts of the person standing in it and using the drag, and making the action of the drag stationary instead of progressive.

The

The extreme scope of this drag not exceeding eighteen inches, may it not require too much time to traverse the uncertain space wherein the object to be searched for lies, to insure its success? The bar-drag, of which Dr. Hawes gave me the sketch, in point of extent and its consequent expedition might answer where the bottom is level, and no ridges or hollows would occur; but, as being a straight piece of wood, it can accommodate itself to no unevennesses, consequently must leave holes, the most likely repository of the object sought for, unsearched.

One cannot but be aware that it will seldom happen that the precise spot can be ascertained, either from the current of the water, the confusion or difference of opinion among spectators, the space to be searched is generally considerable and uncertain. Adverting, therefore, to what Dr. Hawes had sent me, and to the conversation I had with him, as well as the enquiries I had made, I thought something was still wanting; and the desideratum appeared to me to be a machine that would be expeditious, because it was extensive; and secure, because by accommodating itself to the ground, however uneven, it would search holes and hillocks equally. I turned my mind, therefore, to form a machine of this description, and thinking that the buoyancy of the wood would take off from the weight of lead and iron about it, were I to extend it to ten feet in length, I determined on that length for it, and I found my expectation realised in the result. I therefore denominated it a machine or drag, easily drawn by one person, that fishes an extent of ten feet at one sweep, with the certainty of finding a body, if it lies within that space, let the ground be ever so uneven, or the water ever so deep. *Vide Reference and Engravings.*

Permit me, Sir, to request you to submit this account of my machine to the Society of Arts, &c. accompanied with models

models and a drawing, and should they be honoured with the approbation of the Society, I shall feel myself much gratified, as their sanction could not fail to promote their publicity.

I have the honour to be,

Sir,

Your most obedient servant,

JOHN MILLER.

Bedford, Feb. 28, 1809.

To C. Taylor, M.D. Sec.

Reference and Description of Mr. Miller's Apparatus for Raising the Bodies of Persons sunk under Water. Pl. III. IV. Fig. 1, 2, 3, 4.

This machine consists of a round piece of deal A A, fig. 1, ten feet in length, and two inches and an half in diameter; at thirteen inches from each end of it, a square piece of deal B, twelve inches in length, and one inch and an half in diameter, made firm by a bracket, is let in and glued or nailed. To this bar four six-pointed drags, C C C C, are suspended at equal distances. These drags are weighted with two pounds of lead affixed or run on to the lower end of their shafts or stems, to steady them when in action, and to keep their points from running into the ground, which had they nothing to counteract their weight and preponderancy at top, they would do. The buoyancy of the bar on the one hand, and the weight of the lead at the bottom of the drags on the other, has the effect of keeping the drags

in

Mr. Miller's apparatus, for raising the Bodies of Persons, sunk under Water.

Fig. 1.

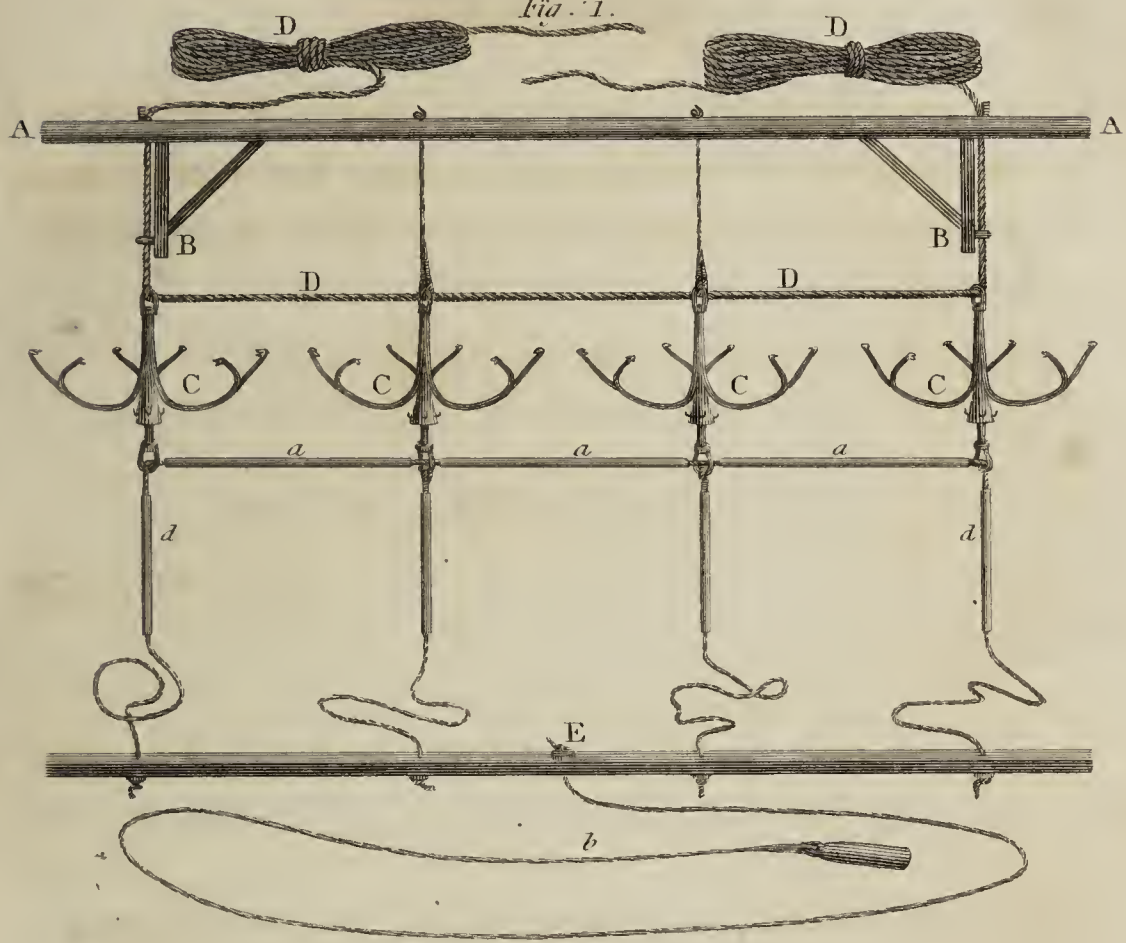


Fig. 2.

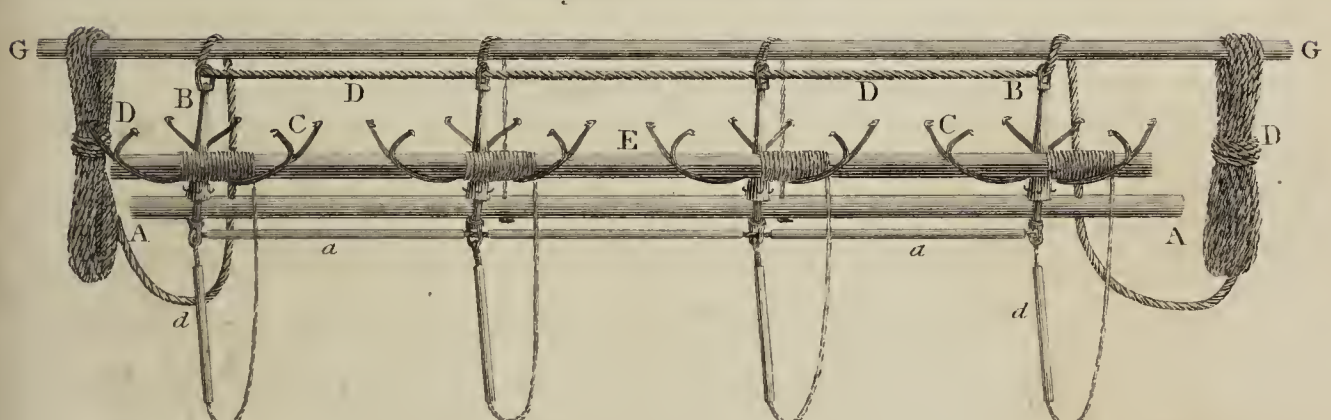


Fig. 3.

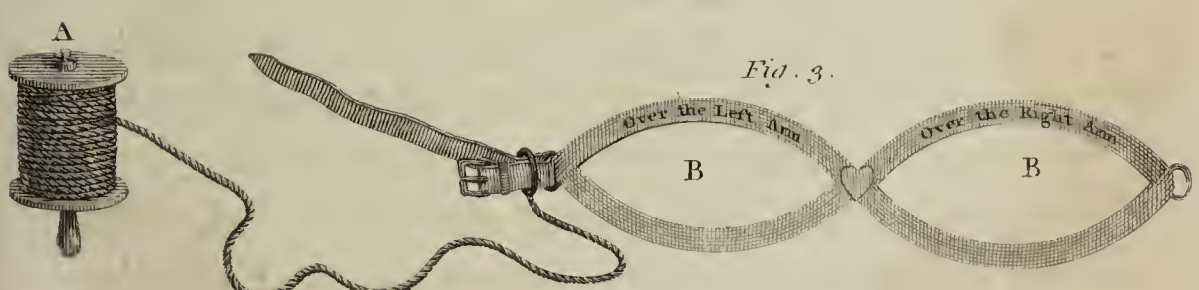
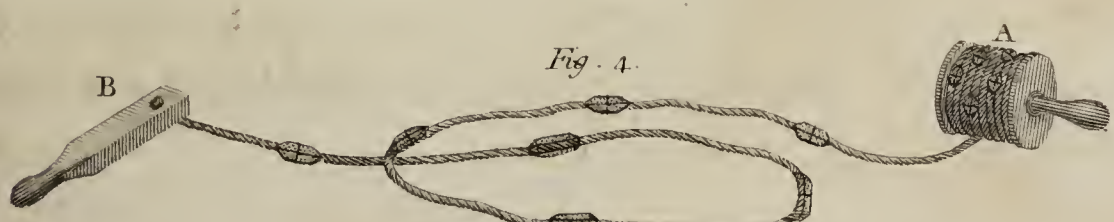


Fig. 4.



J. Farey Jun.r del

Engraved by

in an upright position when at rest in the water, and in a diagonal one when pulled forward, scraping the ground, but not entering it. Each drag, as shewn in Pl. IV. fig. 7, has a swivel at both ends of its shaft or stem. Its whole length, including swivels, is about nineteen inches. At nine and a half inches from the top, the hooks, which are three only at their base, but which are subdivided at eight inches from their ends, take their rise. They are curved, and their points when turned up again are about four inches below the level of their tops, and thirteen inches asunder; and the outside point of each sub-division is thirteen inches from its adjoining one. The extreme points are split and formed into a double hook, very sharp and pointing towards the stem.

Holes are bored through the bar A at equal distances, so as the hooks when suspended may approach each other within five inches. Through those at the end, which are larger than the others, and made close to the pieces of wood let into the bar, the principal or drawing ropes D D pass. This rope is of considerable length and strength, and goes through the top-swivels of all the drags. It is then made fast by wooden wedges driven into the holes through which it passes, at such a length as will suspend the two end drags a few inches below the end of the pieces of wood let into the bar. The other three drags are suspended at the same distance from the bar by lines of an equal length coming through the holes in the bar, and tied to their top-swivels. These three drags, as well as the two end ones, are made fast to the principal or drawing rope at equal distances with a piece of tar-line tied to their top-swivels. And the two outside drags are kept in their proper situation by the principal rope going through a staple fixed in the pieces of wood let into the bar, and the two others are kept either

from

from approaching or entangling with one another, or the outside ones, by bored pieces of wood, *a a*, of equal lengths placed between each drag at the bottom, through which and their bottom swivels a rope made fast to the bottom swivels of the two outside drags passes. The drags, however tied or fastened their swivels may be, always have their own rotary motion free, consequently their points by their own gravity will always assume and retain their proper position when in action. The bar clears the way for the drags, breaking and removing weeds or what else might otherwise impede their progress and action. The drags, being suspended to the bar and separated from each other by nothing but what will give way, are undulatory in their progress as the bottom is, but will yet preserve the full extent of their sweep.

Thus formed, the machine is ready for use, and may be drawn in this shape backwards and forwards at pleasure; but should the water wherein it is to be used be thought to contain roots of trees, or any thing likely to occasion the necessity of drawing up or releasing any one of the drags from the obstacle it has met with, then another appendage is advisable: a bar E, less in substance than the leading one, but of the same length, and which, for distinction sake, I call the floating-bar. Holes are made through this bar at the same distance from each other as those in the leading bar, and ropes of equal length (either ten feet, or any other length that may be chosen) after having been tied to the bottom swivels of all the drags are to be brought through these holes, and there stopped, either by a knot or pieces of cork at their ends. By this means any particular drag may be got at, without altering the position of the others, for, as far as the flexibility of the rope in the intermediate spaces between the several drags will admit, each is free and independent of the other;

and

and since, by means of these ropes, a parallelism is preserved from the leading-bar to the floating one, the floating one of course brings into view the direction the one which is sunk is taking.

Should the current of water be strong, it would carry the floating-bar before the leading one in drawing down stream. A rope *b*, therefore, weighted with a stone or piece of lead at its end, is requisite. This will act as a kind of anchor to it, will steady it, and keep it where it ought to be, behind the leading one. If bored pieces of deal *d d*, 15 inches long, are, after passing the ropes of the floating-bar through them, made fast by wooden wedges to those ropes, at three inches distance from the bottoms of the drags, they will by their buoyancy and tension prevent these ropes of the floating-bar entangling round the points of the drags.

With the floating-bar attached to it, the progress of the bar cannot be instantly changed from straight forward to retrograde. For without making a sweep something circuitous, the ropes would entangle. But if a rope is fastened either to the middle of the floating-bar, or to that rope which operates as an anchor to it, by means of that the whole machine may be drawn back, and the same sweep repeated as often as required.

Should the floating-bar, for the purpose of disengaging any particular drag be thought unnecessary, but that it is desirable to know what direction the one sunk is taking, and that the drawing backwards and forwards is an object, the floating-bar, provided the holes at the ends of it are made sufficiently large, will do this by changing its direction from being a following bar into that of a leading one by this means. Detach it from the drags by untying its ropes from the bottom swivels. Pull them out of the floating-bar, and then pass the two ends of the principal or drawing rope

through

through the holes next the ends of it, and let it slip down to the leading-bar; its own buoyancy will bring it to the surface of the water, and the operation of a man's pulling the drawing rope, will, by compression, keep it there.

The cost of this drag and appendages is three guineas.

Plate III fig. 2, represents the drag in the state in which it should be preserved ready for use, or the manner in which it should be carried from place to place, to prevent any part from entangling. G G is a pole over which that part of the apparatus marked A and B is laid, and on which the cords D D folded up are hung, the drags C C C C remain suspended on the nearer side of the pole, and the floating-bar E is laid within the drags with the hollow tubes *d d* below it.

Plate IV. fig. 7, shews one of the drags separate from the rest of the apparatus, with the dimensions of each part of the drag on an enlarged scale.

So closely connected with this subject of life preservation are two other machines which I have had made, that, on the presumption that a description of them will not be unacceptable, I shall annex it.

One of them I call the Reel Safeguard, devised by me for the security of persons going to the assistance of a drowning person, or diving for them.

The other a Missile Rope, capable of being flung to a person in distress, at a considerable distance from the shore.

This missile rope, (fig. 4, plate III.) 35 yards in length, is rendered buoyant by pieces of cork fastened to it, at intervals of three or four feet. It is made fast at one end to a wooden reel A, six inches in diameter, and sixteen in length, on which it should always be kept wound, to prevent the ropes kinking, and for being in readiness. But when used, it must be unwound, because the corks are an obstacle to its running off the reel in the throw, and it should

should be spread on the ground, or held in the hand, free from entanglement, so as not to catch or impede the throw. The throwing end of the rope is fastened to a piece of wood B shaped like the but end of an oar, as no shape can be better devised for the purpose of throwing it from the hand. The person throwing it holds fast the reel in his other hand.

The cost of this is seven shillings and six-pence.

The reef safeguard consists of a rope or line thirty-five yards long, made fast at one end to a reel (A, fig. 3) six inches in diameter, and ten in length. To the other end of this rope, a brass or iron tinned ring, large enough to admit of the leather and buckle part of the shoulder-straps passing through it is fastened. The other part consists of two straps B B, of strong sadler's web, 2 inches wide, crossing each other, and well sown together just above the pit of the stomach, and after leaving a sufficient space for admitting the arms, the ends on each side are fastened together. To the ends behind the left shoulder, a brass or iron tinned ring of an inch and half diameter is well fastened, and to the ends behind the right shoulder, a buckle and strap 18 inches long is fastened. If the space for the arms to pass through is proper, and the ring behind the left shoulder, and strap behind the right, properly placed, the pull from behind will be so equal, that the brace will neither press on the pit or stomach, or the windpipe; two essentials in swimming and diving. To insure this safeguard being put on properly, when hurry requires the use of it, "*Over the left arm*," "*Over the right arm*," should be written or stamped on the inside of the web part with printer's ink. The person using this, slips his arms into the brace, whilst another, having first passed the buckle and strap (which is at the end of the brace behind the right shoulder) through the ring at the end of the rope, puts the strap through the

ring behind the left shoulder, and buckles it to the size of the wearer. This person keeps fast hold of the reel, whilst the wearer plunges into the water; and the facility with which the rope runs off the reel, prevents its being any impediment either in swimming or diving.

When it is required to pull the person wearing it to the shore, it is not to be done by winding the rope on the reel, but by shortening the rope by passing one hand over the other as quick as possible. This will pull the wearer on his back, and from the elevated position of the person pulling, whether he is on shore or in a boat, the wearer's head and shoulders will be pulled out of the water, and prevents the immersion of his head either from debility, his efforts, or any weight he may have hold of.

The cost of this is eight shilling and six-pence.

Certificates were received from JOHN WING, Esq. Mayor of Bedford; Dr. G. YEETS; Mr. CHARLES SHORT, Surgeon; and Mr. P. NASH; stating that they had witnessed the experiments made by Mr. Miller's Drags, and are of opinion, that they are well calculated for quickly finding and raising the bodies of persons who have sunk under water, and that the escape of a body when once touched therewith seems almost impossible.

The SILVER MEDAL *of the Society was this Session voted to Mr.* THOMAS NEWTON, *of Bridge-street, Blackfriars, for a Machine for Cutting Roots for Cattle, Articles for Dyers' Use, or for Culinary Purposes. The following Communication was received from him, an explanatory Engraving is annexed, and a complete Model of the Machine is preserved in the Society's Repository.*

SIR,

I HAVE taken the liberty of submitting to the inspection of the Society of Arts, &c. the model of a machine for cutting roots and different substances, and which is particularly well calculated for the chopping of sausage meat. Though its value in this latter respect may at first appear inconsiderable, yet the great demand in most towns for that article, and the many hands it requires to make the meat fit for use, will, on inquiry, show that it is of consequence. Many of the sausage makers employ four or five men constantly in this business, and frequently three or four hundred weight of meat is cut up by one house in a day.

The advantages of this invention consist in saving labour, time, and waste of meat. There are in this machine five knives, which are let into an iron plate, which is screwed to the working bar.

The knives are fastened by bolts passed through them close under and above the plate.

The sliding plate is for the purpose of preventing the meat being scattered; and to this plate are added scrapers,

which are screwed underneath, for the purpose of clearing the knives at every stroke.

The spring raises the knives, and enables any person to chop at least twenty times as much meat in the same time as can be done by the common mode.

The length of the knives being equal to the breadth of the trough, no meat can possibly escape the knives, nor will the meat require so much turning as is usually wanted. If it should require turning, it is easily done by alternately pressing the knives at either end of the trough, sliding them towards the middle.

When the meat is sufficiently chopped, the bar to which the knives are fixed may be lifted entirely free from the sliding plate, by taking the pin out of the guide. Indeed the whole of the moving apparatus may be turned in any direction as occasion may require.

The same machine is also applicable for cutting fat, suet, &c. previous to rendering them into tallow; likewise to chopping madder and other roots for calico-printers, or as used in their recent state for dyers; also for dividing potatoes, carrots, and other esculent roots for farmers in feeding cattle, and may be made at a moderate expense, worked with ease by the hand, and when occasion requires, easily repaired.

Any further information which the Society requires will be furnished with the greatest respect by,

Sir,

Your most obedient humble servant,

THOMAS NEWTON.

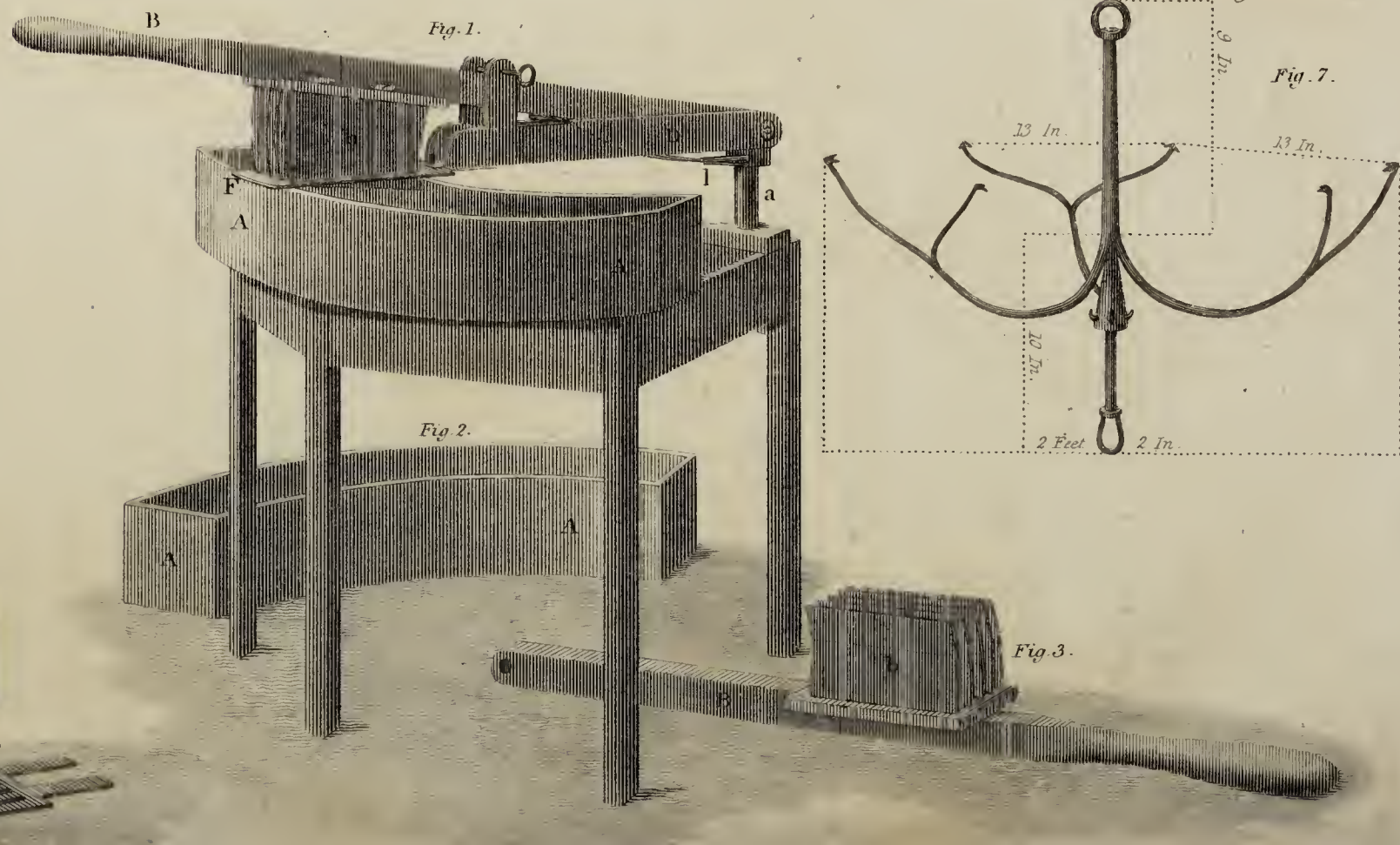
No. 6, *Bridge-street, Blackfriars,*
Feb. 20, 1809.

To C. Taylor, M. D, Sec.

A Certificate

Mr. Newton's Machine for cutting Meat & Roots.

Mr. Millers Drag.



A Certificate was received from Mr. CHRISTOPHER CHRISTIAN, of Liverpool, stating, that Mr. Thomas Newton did there invent a machine for chopping meat, &c. which answered the purpose it was intended for in every respect; and that for ease and quickness of cutting he, Mr. Christian, particularly recommended it.

Explanation of Mr. Newton's Machine for Chopping Meat, Roots, &c.

MR. NEWTON'S machine for chopping meat and various other articles is shown in Pl. IV. Fig. 1. The meat is put into a wooden trough A A, which is a segment of a circle: its form is more clearly shown detached at fig. 2, on the ground. This trough is fixed upon a triangular frame, supported by four legs, about the height of a common work bench. *a* is a short iron axis which is fitted to the angle of the frame, and is the center from which the circle of the trough is struck; it is made forked at the top, to form a joint for the end of the lever B (shown separately on the ground at fig. 3), having the five knives *b* for chopping the meat fixed to it. At D are two pieces of wood, through one end of which the center pin of the lever B passes, and thus connects them with the axis *a* at the other end; they carry a piece of iron plate F, which has five narrow openings made through it to receive the five knives fixed on the lever B. This iron plate always rests upon the edges of the trough A, and acts so as to scrape off the meat, &c. which

would otherwise adhere to the knives. The knives are prevented from rising, so as to be quite lifted out of the openings in the plate F, by the wire pin C, put through the small pieces of wood fixed to the pieces of wood D. A spring *l* is fixed to the axis *a*, and presses on the under side of the lever B to raise it up, that the chopping may be performed the more speedily, as the hand has only to force down, the knives being raised by the spring. The knives are worked by the lever continually backwards and forwards in the trough, so that the article therein is in every part exposed to their action.

When the knives require grinding, any one can be taken out by removing two iron pins: each knife has two tennants (as shown at X, fig. 4) on the back of it, going through corresponding mortises made through a piece of wood fixed under the lever B. The two pins pass through those tennants, and thus hold the knives in their places. The bottom of the trough A is held in by screws, so that it can be taken out and planed flat when worn by the action of the knives.

The perforated plate F is shown separately in figs. 5 and 6.

The

The GOLD MEDAL *of the Society was this Session voted to Captain* WILLIAM BOLTON, *of the Royal Navy, for his Naval Improvements.*

Some doubts having arisen as to the practicability of Rigging Captain William Bolton's Improved Jury Masts, described in Vol. XXVI. page 167, *of the Society's Transactions, he in consequence has sent to the Society another Model thereof completely rigged, which obviates all difficulty therein; and likewise has added another Invention of his contrivance, for the better Securing the Shrouds of Rigging; explanatory Engravings of both are annexed, and the Model is preserved in the Society's Repository.*

SIR,

FINDING some doubts were entertained relative to the practicability of rigging jury masts, upon the plan I had the honour to present to the Society in Oct. 1807, I beg you will lay before them a model completely rigged, from which it will appear that the rigging so placed will give, from the angle being more obtuse, greater security, and supersede the necessity of cathur pinning, and admit of the lower yards bracing sharper up.

The hint which I gave formerly relating to striking a top-mast is now carried into effect, by the mode in which I have fitted the top-mast rigging, which admits of it being set up, almost instantaneously, at any point the mast shall descend to; the advantages of which are many, more particularly when the ships are riding hard in open roadsteads; for, by striking the top-mast, ships will be enabled to ride much longer at their anchors, and still be ready to make sail on their top-masts, according to the state of the weather, which will or ought to determine the distance to which the masts are struck. In this model I also present to the Society a plan, the earliest of my mechanical pursuits, for setting up a ship's lower rigging, which will be effected by one man; whereas in the ordinary way it is performed by an assemblage of tackles, and the labour of a whole ship's company: the larboard side of the model is fitted up according to the old plan; the starboard side with my improvement, which consists simply of a screw attached to each shroud, and tightened by a nut under the channels, which should be well secured by iron clamps or knees for that purpose: the expense will be far less than in the common mode; and I do think the bare inspection of the model will be sufficient to establish its superior efficacy.

I will thank you to expunge the passage from page 168 in the last volume, after the full stop at *main-top*, and substitute the following:

"The spare fore top-mast passes through a cap made from strong plank, *b*, into the square holes of which the heads of the two temporary masts above-mentioned are inserted, and the heel of the top-mast is fidded on the tressle trees or top as in common, and the mast rigged as usually. The object of the strengthening cap G, is to steady the spars,

spars, and also serves to fid the top-mast on, if thought necessary."

I have the honour to be,

Your obedient humble servant,

WM. BOLTON.

H. M. S. Fisguard,
Portsmouth, May 12, 1809.

To C. Taylor, M.D. Sec.

Reference to the Drawing of Captain Bolton's Rigged Jury Mast, and his Improved Mode of Securing the Shrouds, Pl. V. Fig. 1, 2, 3, *and* 4.

A A represent the partners or pieces of timber which are bolted to the quarter-deck for the mast to rest upon. B is the stump of the lower mast, which is cut square at the top, and of the same size as the head of the mast originally was; upon this square the main and spare lower caps *a a* are fixed; two mortices must be cut in the partners A A, to receive squares made at the lower ends of the two temporary masts D D, which are supported by the caps *a a*, one of them is a spare main top-mast, the other a hand-mast; these two support the main-top E, additional squares being made on the tressel trees to receive each of them. *b* is a cap shown in fig. 3, made of four-inch plank doubled for the purpose, and fitted upon the heads of the masts D D, for a fore top-mast F F, the heel of which rests in a mortice made in the stump of the lower mast; it is also steadied by a double cap G, separately shown in fig. 4, on which it fids finally on the

the top. The top-gallant mast H is fixed to the mast F by the top and cap in the usual manner. The figures 3 and 4 show the caps separated from the masts, and are the only things necessary to be made for the purpose; and the object of the cap, fig. 3, is to steady and prevent any wringing of the lower jury-mast, and to fid the top-mast whenever it is reefed. In the proposed method of securing the shrouds of ships in general on the starboard side, I, represents the screws with loop holes for the shrouds to be lashed to, and K the screw nuts, which by means of a proper wrench may be easily turned, so as to tighten or slacken the shrouds at pleasure. The other side of the ship is shown fitted up in the common way, that the contrast may be observed.

The SILVER MEDAL *of the Society was this Session voted to Mr.* GEORGE WILLIAMS, *Master Carver at his Majesty's Dock Yard, Chatham, for Securing the Beams of Ships, without Wooden Knees made of one Piece. The following Communication was received from him, an explanatory Engraving is annexed, and Models are preserved in the Society's Repository.*

SIR,

I SUBMIT to you, for the inspection of the Society, the following particulars of my invention for the better securing of the beams of ships of war, East and West India ships, and all others where strength, dispatch, room, and cheap-

ness

Capt.ⁿ Bolton's method of rigging his Jury Mast, and setting up a Ships Lower Rigging.

Fig 2.

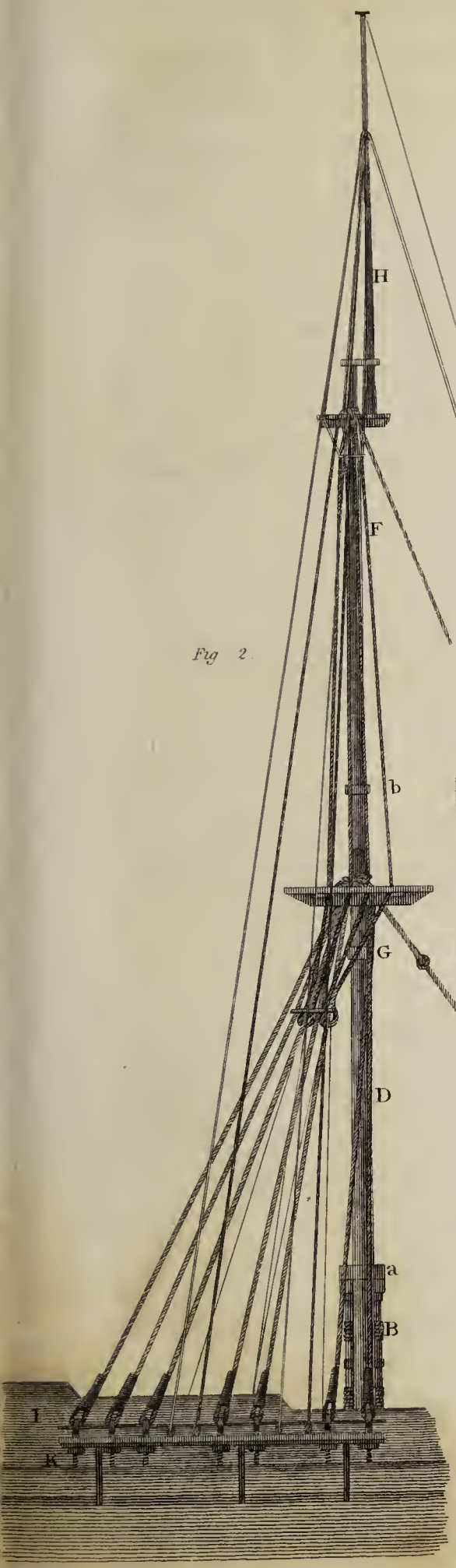


Fig. 3.

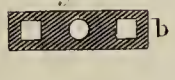


Fig 4.

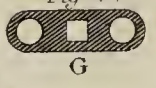
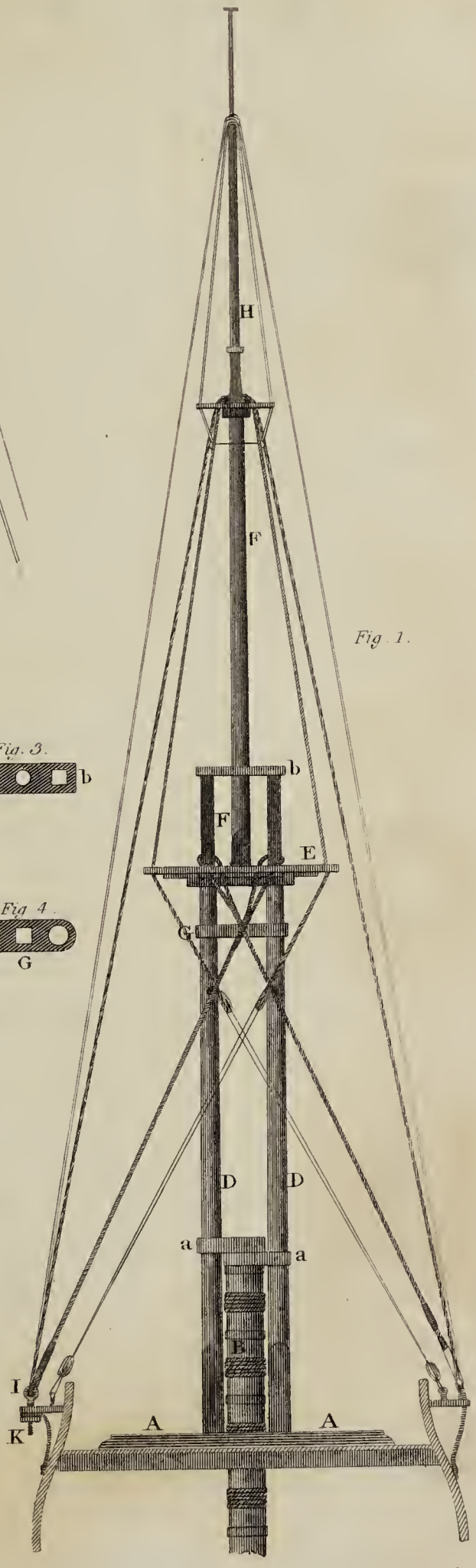


Fig. 1.



Drawn by J Parey, Junr.

Engraved by S Porter

ness are required. In this method less iron in weight, and fewer bolts are necessary than in the iron knees before in use; there is also less strain upon the bolts, as the block underneath is morticed both into the beam and side of the ship, as well as bolted.

Upon this plan the work is all done under the hand, which is executed much quicker than in the former plan, where the work is all done over hand, and where great nicety is requisite in making the bolt-holes which pass through both the iron stays. In my method much more room is also gained between decks for stowage and working the guns, and even a port-hole may be made under the beam itself.

I calculate the saving in a 74-gun ship or East India-man to be as follows, viz.

	Ton.	*Cwt.*	*Qrs.*	*lb.*		£.	*s.*	*d.*
Copper bolts,	2	1	3	9	at 1*s.* 4*d. per lb.*	305	8	0
Iron,		2	12		at 56*s. per cwt.*	145	12	0
Three men and one boy's time for a month						45	17	6
Timber						50	0	0
						£. 546	17	6

The models I have sent will, I trust, clearly explain to the Committee every circumstance which will be thought necessary.

I am, Sir,

Your respectful humble servant,

GEORGE WILLIAMS.

His Majesty's Dock-yard, Chatham,
May 10, 1809.

To C. Taylor, M.D. Sec.

Description

Description of Mr. Williams's Method of connecting the Beams of Ships' Decks to their Sides, Plate VI. Fig. 1, 2, and 3.

By inspecting Plate III. of Vol. XXVI. of the Society's Transactions, in which is another method of accomplishing the same object, invented by Mr. Roberts, the reader will readily comprehend the situation of this contrivance in the vessel, being a substitute for the wooden knees commonly used to connect the cross beams of the ship with the sides. Fig. 1 is an horizontal plan of a portion of a ship's side, the planks of the deck being removed to shew the ends of two of the beams A A, which extend across the vessel. B B is the outside planking of the ship; C C the sections of the timbers or ribs; and to these the beams A A are fastened by beaten iron triangular braces *a a*, similar in form to the Roman capital letter A. These are let into the beams, and attached there at the angle by three bolts going through them. Fig. 2, is a front view of only one beam, where the spectator is supposed to be looking towards the ship's side; and fig. 3, is part of a cross section of the vessel's side: the same letters are used as in the other figures. By inspecting these, it will be seen that the ends of the brace *a a* are turned up and bolted to the timbers of the ship's side by two bolts passing through each end and through the timbers and the outside planks, by this means the beams are secured from lateral motion; and to brace them in a vertical direction the wooden block H, fig. 3, is fitted in beneath them, and two iron straps bolted on them; one end of each of these straps is attached to the deck beams by the same bolts as the upper brace *aa*: the other ends are bolted against the inside planking, and an oblique bolt *h*, fig. 3, passes through the middle of each strap

strap and the ship's side: *l l l*, fig. 1, are the small intermediate beams, answering to the joists of a floor, to which the planks of the deck are spiked down: *m*, fig. 1, represents one of the planks, and the dotted lines show the joints of the others. In fig. 3, these planks are shown, and the other beams to make all sound and firm, which were removed in the other figures to show the braces.

The SILVER MEDAL *of the Society was this Session voted to Mr.* J. VARTY, *of Liverpool, Coachmaker, for his Invention of a Method to prevent the Accidents which frequently happen from the Linch Pins of Carriages breaking or coming out. The following Communication was received from him, and a Model of an Axle and Linch Pin are placed in the Society's Repository.*

SIR,

HEREWITH you will receive a model of an axle-tree for public machines, intended to prevent the wheel from coming off if the linch-pin should break, and thereby prevent many dangerous consequences. When the idea first suggested itself to me, I put it in practice in a stage-coach which has since run from Liverpool to Lichfield, a distance of eighty-four miles, six days per week, for the last six months. During that time several instances have occurred in which the linch-pins have broke or come out, but owing to this contrivance no accident has happened therefrom. We

almost

almost daily hear of stage-coaches being upset, which more frequently arises from linch-pins breaking than from any other cause.

In offering this model to the Society of Arts, &c. for their inspection, I anticipate the pleasure of their sanction, as I can furnish satisfactory vouchers of its proved utility.

I am, Sir,

Your's, respectfully,

J. VARTY.

Liverpool, Feb. 6, 1809.

To C. Taylor, M. D. Sec.

Certificates were received from Liverpool from the following persons, who declare that they have witnessed many very melancholy accidents happening to passengers in stage-coaches, in consequence of the linch-pin breaking made in the common way, and from which some of them have been sufferers; but that they have never seen or heard of any such accidents where Mr. Varty's invention was made use of, though several of his linch-pins have broke.

Henry Livesley, who had a broken leg in consequence of one of the common linch-pins breaking.

John Smith, who suffered a similar accident from a similar cause.

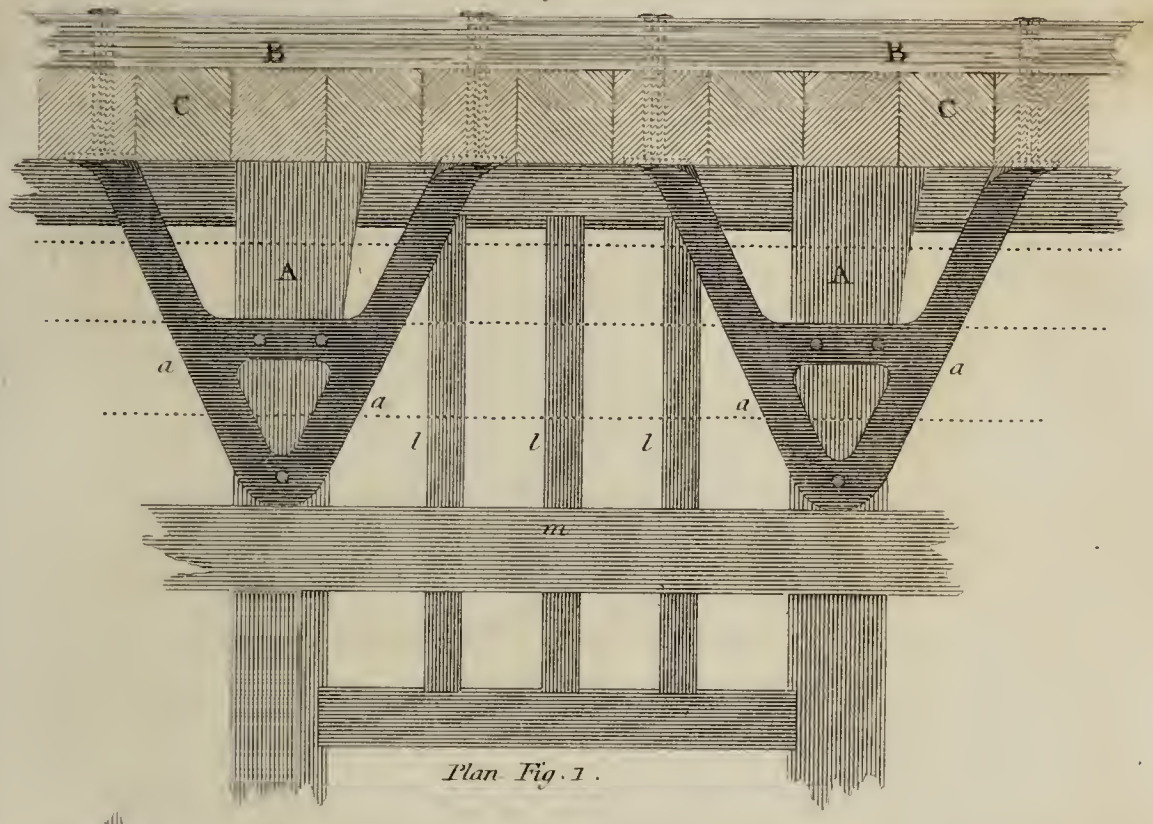
James Kelly, Guard to the royal Liverpool coach.

John Armstrong, Coachman.

James White, Guard.

George

Mr. Williams method of connecting the beams of Ships with their Sides.



Plan Fig. 1.

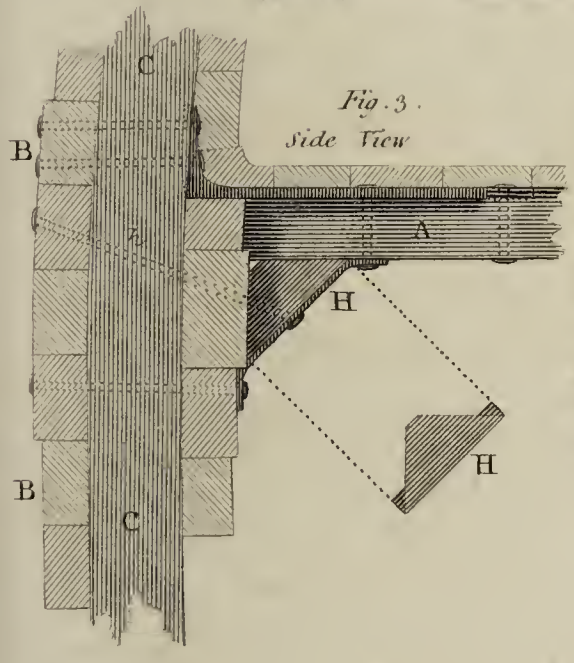
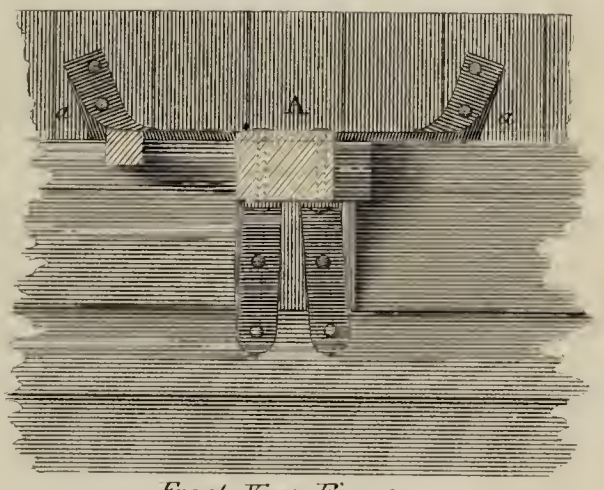


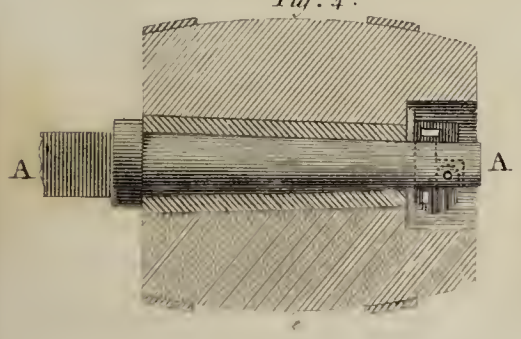
Fig. 3.
Side View



Front View Fig. 2.

Mr. Varty's improvement in the Linch. Pins of Axletrees.

Fig. 4.



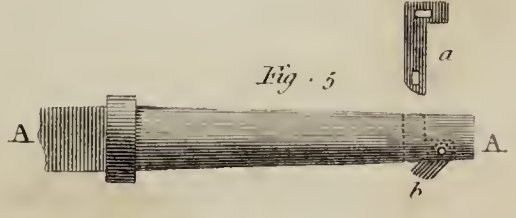


Fig. 5.

Jun^r. del.

Engraved by S. Porter.

GEORGE ROBINSON, Manchester coachman.

JOHN CASTREE, ditto.

WILLIAM CAWKWELL, ditto.

GEORGE KAYE, ditto.

RICHARD MOUNTAIN, Coachman.

Description of Mr. Varty's Linch-Pin.

Mr. VARTY's contrivance is shown in fig. 4 and 5, Plate VI. Fig. 4 is a section of the nave of a carriage wheel, with the axle-tree A A in it; and fig. 5 is a separate view of the axle-tree. *a*, fig. 5, is the linch-pin detached; it is put through an oblong hole in the axle as usual, but there is likewise an additional linch-pin *b*, to make it complete, which is fixed in a recess cut for it in the axle, and turns on a pin (as is shown in the figure) into the hole left, by removing the linch-pin *a*, when the wheel is to be taken off; but if the linch-pin *a* should accidentally get out, this additional pin *b* would effectually keep the wheel on, as its hanging position does not at all tend to shut the pin up into the axle, but the contrary. The common linch-pin *a* is put in downwards, that its weight may also tend to keep it in, and is secured in the usual way by a strap, the holes for which may be seen in the figures. The whole when in its place is shown by fig. 4.

The

The GOLD MEDAL *of the Society was this Session voted to* MATTHEW MURRAY, *Esq. of Leeds, for a Machine for Hackling Hemp or Flax. The following Communication was received from him, an explanatory Engraving is annexed, and a complete Working Model is preserved in the Society's Repository.*

SIR,

HAVING invented and put in practice a machine for the purpose of hackling flax and hemp in an expeditious and more perfect manner than hath hitherto been done either by hand or machinery, I have taken the liberty of sending a model thereof to the Society. From its national importance as a powerful auxiliary to the state of our linen manufactory, which is at present cramped by the refractory conduct and inability of hand hacklers, it has been represented to me that this machine, which will produce the best effect on the material, is extremely desirable. I believe that I have completely effected the end, and hope that this machine will deserve the Society's attention.

I have the honour to be,

Sir,

Your most obedient humble servant,

MATTHEW MURRAY.

Leeds, Feb. 10, 1809.

To C. TAYLOR, M. D. SEC.

SIR,

SIR,

In answer to your further inquiries, it is with pleasure I can inform you that the hackling machine succeeds equal to my expectation. The principle of it is, that the flax is brought perpendicularly down upon the teeth of the hackles. The hackle moves through the flax in the direction of the fibres, and is only suffered to penetrate as the fibres become open or separate. By this circumstance a great saving in the waste of flax is made, and the flax thus dressed attains a higher degree of perfection for spinning.

The quantity of the dressed flax obtained from a given weight by this machine, in comparison with that dressed in the ordinary way, is obvious, when the properties of the machine are examined. It reduces the operation to a certainty, which was not so before, which is of material importance for mill spinning, as flax does not undergo any other separating process after being hackled, but is taken immediately from the hackle to the rollers. No carding, as is done to cotton or wool, can be applied to flax, therefore the necessity of perfect hackling may be easily inferred; and the performance of this machine gives me great hopes that we may now be enabled to manufacture our finest linen fabrics by machinery at a cheaper rate than at present, as a similar reduction has taken place in cotton manufactures since the invention of spinning cotton by machinery. I have inclosed certificates from three gentlemen who have attended the performance of the machine this month past, and who have determined to introduce them into their extensive manufactories for spinning linen yarn.

Messrs. Bell and Bragg, proprietors of a large flax mill at Whitehaven, have also given orders for machinery to be

begun upon this principle; and from the performance of the machine I have no doubt of its success.

I am, Sir,

Your most obedient humble servant,

M. MURRAY.

Leeds, April 10, 1809.

To C. Taylor, M. D. Sec.

Certificates.

We, whose names are hereunto subscribed, have examined Mr. Murray's machine for hackling flax and hemp, and we are of opinion that it will be a great advantage to the flax spinning mills and linen manufactories, as it appears to have the properties of dressing the flax with more certainty and suitableness for mill-spinning.

It does not make so much waste as is generally made by hand. The savings in the trials we have seen are about one-tenth compared with the same flax hackled in the old way. The machine now dresses three hundred weight of flax per day, and requires not more than two-thirds of the cost in attendance as hackling by the hand.

The simplicity of the machine renders it perfectly easy to manage with little care.

David Wood,
James Tennant,
James Shaw,
George Cobb.

Leeds, April 10, 1809.

Description

Description of Mr. Murray's Machine for Hackling Hemp. Plate VII.

A perspective view of Mr. Murray's machine for hackling hemp will be found in Plate VII. The flax is combed or hackled by three hackles, A B C, (one of which is shown detached in fig. 2), fixed in the circumference of a large cylinder or drum, which is turned round in the direction from A to B, by the action of a water wheel, steam engine, or any other first moving power; the flax or hemp is attached to the square frame E, which moves upon the points of the screws *a b*, as an axis; one end of the parcel of hemp to be hackled is placed between the two pieces of wood *e*, *f*, called hands, shown separately in fig. 3, which are placed on the frame, and held thereto by two screws *g*, *g*, which also draw the two pieces of wood *e*, *f*, close together, and thus confine the flax or hemp to the frame E, as the cylinder turns round the ends of the hackle or combs A B C, which project beyond the plane of the cylinder, meet the inclined plane *h*, (shown by dots) upon the frame E, and is raised upon the centers *a*, *b*, so that the teeth of the hackle can pass by clear of the frame E; the inclined plane now drops off the ends of the hackles, the hemp falling upon their teeth, which proceed forwards, and comb it in a manner similar to the action of the hand.

The end of the axis upon which the cylinder is mounted has a pinion of eleven teeth fixed upon it, which turns a wheel *i* of forty-four teeth, having a pinion of fourteen teeth fixed to it, and thereby turning a large wheel, *k*, of seventy teeth; the axis of this wheel goes through the whole length of the frame, and has at the other end a spiral plate or snail *y*, fixed upon it, which makes one revolution to every

twenty of the drum; *l* is the center of a lever *m*, one end of which is supported on the snail, while the other forms a stop to the frame E, and prevents it falling upon the cylinder; as the snail turns slowly round, this lever is alternately elevated and depressed, and by that means the frame E falls gradually nearer to the cylinder, and the teeth of the hackles enter farther into the parcel of hemp suspended from the frame E. The operation of the hackling is begun at the time when the claws of the lever *m*, has just fallen from the largest to the smallest radius of the snail *y*, consequently the end which supports the frame E, is at its greatest height. The two screws *g g*, must then be turned back, the two pieces of wood or hands *e f*, taken away and opened, as shown in fig. 3, and the end of a parcel of hemp is placed between them; they are now returned to the machine, the hemp being turned down between the piece of wood *f*, and the cross-bar of the frame E, by tightening the screws *g g*, the hemp will be held tight, so as not to be drawn out by the action of the hackles. The machine is now put in motion, and as the hackles pass by they lift up the frame E, then let the hemp fall upon the teeth of the hackles; at the commencement of the operation it falls but a small distance on the point of the hackles before it is stopped by the end of the lever *m*, by this means the ends of the hemp only are hackled at first, but as the operation proceeds, the snail turns round and permits the frame E to fall further, that the teeth of the hackles may take deeper hold of the hemp, till at length when the great cylinder has made twenty revolutions, and the hemp has been hackled sixty times, the snail has raised the lever to the highest, and the teeth of the hackle pass quite through the hemp; and as soon as the lever drops to the smallest radius of the snail, the first operation is supposed to be completed, the machine is thrown

out

Pl. 7.

Mr. Murray's Machine for Hackling Hemp.

Fig. 1.

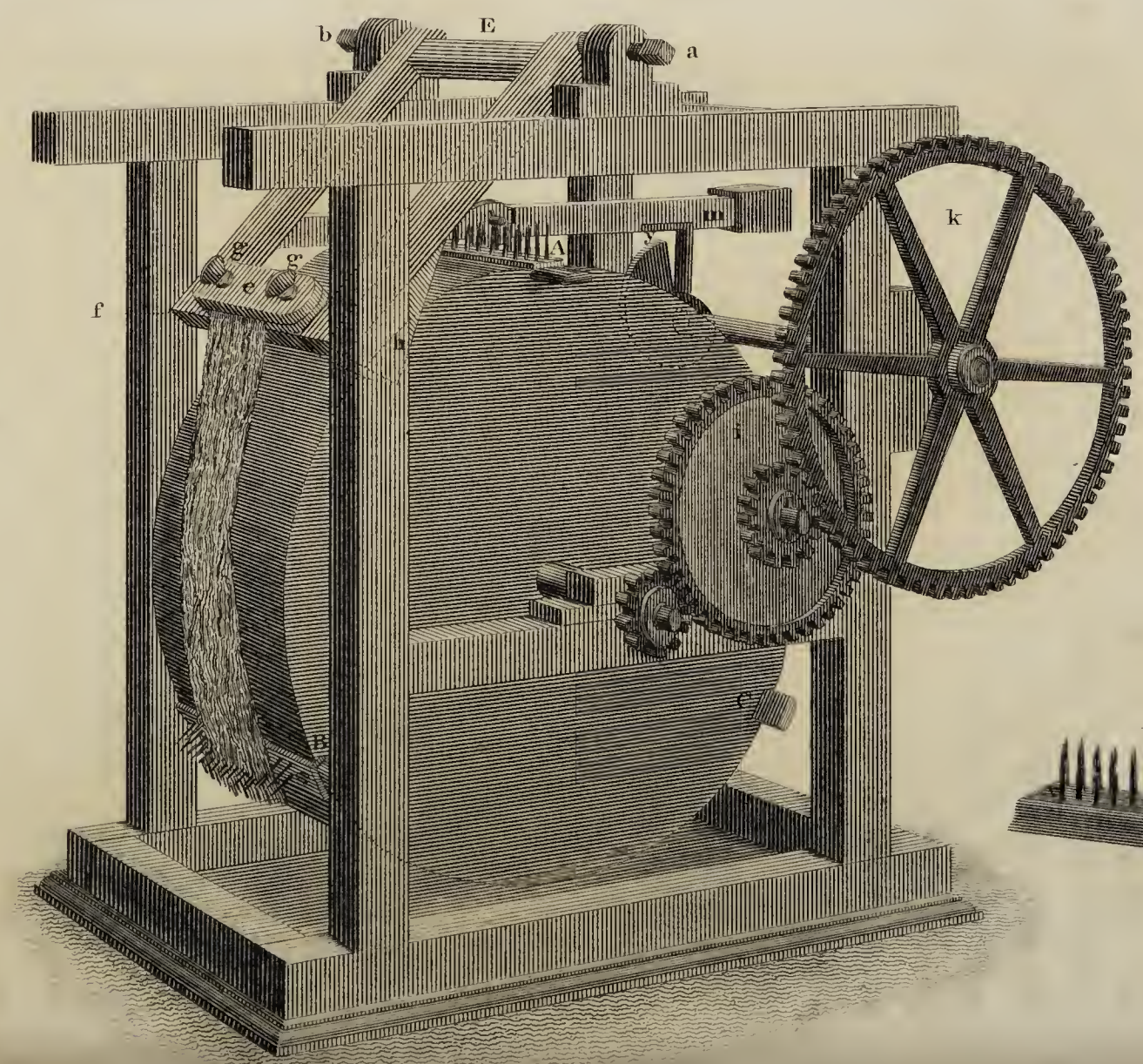


Fig. 2.

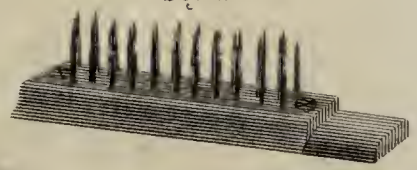
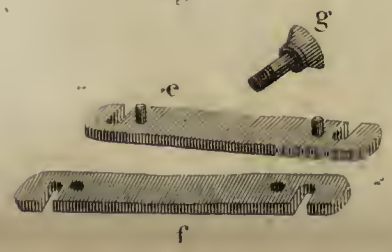


Fig. 3.



out of geer and stopped, and the hemp is unwrapped and reversed, that the other end may be also hackled; and when that is hackled, it is then removed to make room for a fresh parcel. Fig 2, is a separate view of one of the hackles detached from the cylinder, showing the manner in which it is dove-tailed into the cylinder and held by two screws.

The SILVER MEDAL *of the Society was this Session voted to Mr.* KNIGHT SPENCER, *of Bromley-Lodge, near Bow, for an Anthropo Telegraph, or Mode of Communication in the Day or Night, by Disks. The following Communication was received from him, an explanatory Engraving is annexed, and the Disks and Lanthorn, with a Drawing, are reserved in the Society's Repository.*

SIR,

I REQUEST your permission to lay the enclosed before the Society of Arts, &c. It is a drawing of a Portable Military Telegraph, which I invented so long ago as the year 1804, and I am proud to say, that Admiral Hunter, who was stationed at Portsmouth in 1806, gave it as his opinion, that it was very applicable to naval purposes. I have lately been making satisfactory experiments with it by *night*, and should you deem it worthy encouragement, I would solicit permission personally to explain the whole of my operation to the Committee. I am, Sir,

Your obedient servant,

KNIGHT SPENCER.

Bromley-Lodge, near Bow, Oct. 26, 1808.

To C. TAYLOR, M. D. SEC.

DEAR SIR,

AGREEABLE to the wishes of the Committee of last night, I now enclose you two letters from Admiral (then Captain) Hunter, dated the 18th and 27th of April, 1806, on the subject of my telegraph, and I find by referring to my painter's bill, that my *first disks* were made in July or August 1805, and I made experiments with them at Brighton at that time, in company with Mr. Talver, hop merchant, in the Borough; Mr. Pritchard, oil-merchant, West Smithfield; and several other gentlemen, whose names I have forgot; but the idea first occurred to my mind in 1804.

I trust that these particulars and documents will prove my invention as far back as the summer of 1805.

I have also, agreeable to the wishes of the Committee, sent you a pair of disks made early in 1806.

I am now preparing a proper set of lamps (or lanthorns) for night signals, which I will lay before the Committee, if required, and at the same time give such further explanation as they may deem necessary.

I am, dear Sir,

Your obedient servant,

KNIGHT SPENCER.

Bromley-Lodge, Dec. 9, 1808.

TO C. TAYLOR, M.D. SEC.

Letters

Letters from Admiral Hunter respecting Mr. Knight Spencer's Anthropo-Telegraph.

(No. I.)

My Dear Sir,

I had the pleasure of receiving your favour of the 14th, and have not since been so fortunate as to see Captain Irwin, otherwise you should have heard from me sooner. I have, however, been to the Admiral's office, where all telegraphic concerns are transacted; and in the possession of Lieutenant Harrison (a clever intelligent officer) I found your portable machine. Mr. Harrison told me, that he thought it a very good thing, and would be very useful between ship and ship at sea, when the weather was too bad to have any communication by other means; indeed it appears to me to be superior to any other mode of communication by signal; it is so perfectly simple that a child may understand it. Mr. H. has the management of all the telegraphic signals here, and is completely master of that kind of conveyance. He said that Captain Irwin with him had tried it from the battery at Portsmouth, to the flag-ship at Spithead, and they understood every signal, and answered them. He is going soon to try it on South-sea Common, when I will endeavour to be there.

I am, dear Sir,

Very truly your's,

JOHN HUNTER.

Portsea, April 18, 1806.

To Knight Spencer, Esq.

Bromley-Lodge, near Bow.

Letter from Admiral Hunter.

(No. II.)

DEAR SIR,

As I suppose you may be a little impatient to know if we have made any further observations upon your portable telegraph, I would not delay informing you, that I received the pair of disks or circulars addressed to me, and that Captain Irwin, Lieut. Harrison, and myself, went out yesterday to South-sea Common, and gave them a fair trial, and I have pleasure in saying, that we were much pleased with the very simple manner in which we could converse at a considerable distance with them. We applied them to Sir Home Popham's telegraphic vocabulary, which answered our most sanguine wishes. The men here who reside at the telegraph-house, and are employed in working it, were so pleased with its simplicity, that they were of opinion they could make themselves understood in a clear day on Portdown-hill, if the circulars were enlarged to two feet diameter, a size which from their being so light and manageable, I would recommend; and let the ball be one foot, and the rim six inches. We approve the black and white colours best, painted as those you sent me; on one side black ball and white rim, on the other a white ball and black rim; and according to the state of the weather, that side can be used which is best seen.

I am, dear Sir,

Very truly your's,

JOHN HUNTER.

Portsmouth, April 27, 1806.

TO KNIGHT SPENCER, ESQ.

Bromley-Lodge, near Bow.

Letter

Letter from Henry Lawson, Esq. respecting Mr. Knight Spencer's Anthropo Telegraph.

DEAR SIR,

IN answer to your enquiry, about the time I had the pleasure of making some experiments with you, to ascertain the utility and performance of a manual telegraph, contrived by you for the purpose of communicating with promptitude, and without risk of mistake, to any distance, without any other apparatus at each station, than two wooden or wicker disks, to be held by the hands; and if the persons using the disks were obliged to station themselves further from each other than the unassisted eye could command, in that case a pocket telescope was to be used.

If I recollect right, you told me you had made some experiments at Brighthelmston some months before, but the time I made the trials with you at Bromley-Lodge was in the autumn of 1805, or the spring of 1806, but I rather think the former period was the time.

I remain,

My dear Sir,

With much esteem,

Your's ever,

HENRY LAWSON.

45, Gower-street, 26th Dec. 1808.

KNIGHT SPENCER, Esq.
Bromley-Lodge.

SIR,

SIR,

HAVING been engaged in the Volunteer service since the year 1798, and of course often present when large bodies of men were assembled in the field for manœuvre, it appeared to me that much time was lost in conveying the orders of the commander in chief, to the general officers commanding distant divisions; and the posting of officers at intermediate distances, to convey the orders to "march," "halt," &c. by waving a hat, appearing to me a very clumsy and uncertain mode, in 1804 I set about contriving what I now take the liberty to call my Anthropo-Telegraph, which besides obviating the uncertainty just mentioned, I flattered myself in the event of an invasion, it would afford considerable facilities of communication throughout the country, as it combines with the certainty of every other mode of telegraphic communication, the very desireable qualities of simplicity and cheapness, and might be introduced into every corps in the service, without the addition of a single man, and with so trifling an expense, as not to be worth notice when compared with the advantages which I presume could not fail to result from the use of it, and which I need not here enumerate, as they will occur to the mind of every intelligent person.

As a proof of its simplicity, and the ease with which a perfect knowledge of it may be gained, I beg leave to state, that in the year 1806, I engaged indiscriminately four privates of the South Gloucester militia to assist me in making experiments on the Downs at Brighton, and after one hour's drill they made every signal with the utmost correctness.

It was suggested to me by an experienced naval officer, that my invention might be of great service in the navy, and accordingly

accordingly in the spring 1806, I sent it to the Port Admiral's office at Portsmouth, where the telegraphic business is transacted, when several very satisfactory experiments were made with it, particularly one from the battery to the flag ship at Spithead, a distance of three to four miles, and every signal was easily understood and answered.

Before I enter upon the explanation, permit me to observe, that my signals, like those used in the royal navy, are numerical, and of course without limit as to the extent to which they may be carried, and with the assistance of Sir Home Popham's numbered dictionary, now generally adopted, every kind of communication may be made, and conversations on any subject carried on at a distance of from one mile to three or more, according to the circumstance of situation, weather, &c. &c. with the utmost certainty and celerity.

Reference to the Engraving of Mr. Knight Spencer's Telegraph, Plate VIII.

Letter A represents the telegrapher in the position of attention, furnished with a pair of disks made of wicker, or basket work, about 18 inches diameter (with handles six inches long), painted white with a black ball in the centre, weighing about one pound each, and value together about six shillings.

The ten figures represent the numerals, No. 1, 2, 3, 4, 5, 6, 7, 8, 9, and 0.

B represents the signal of point or period, and is to be made

made at the close of every number, by bringing the disk in the right hand in front of the breast, placing that in the left hand at the same time upon the back.

The reason for placing a disk on the back, is, that when three or more stations are used, the middle station signals of *point* may be seen in the rear as well as in front, as all the other signals are.

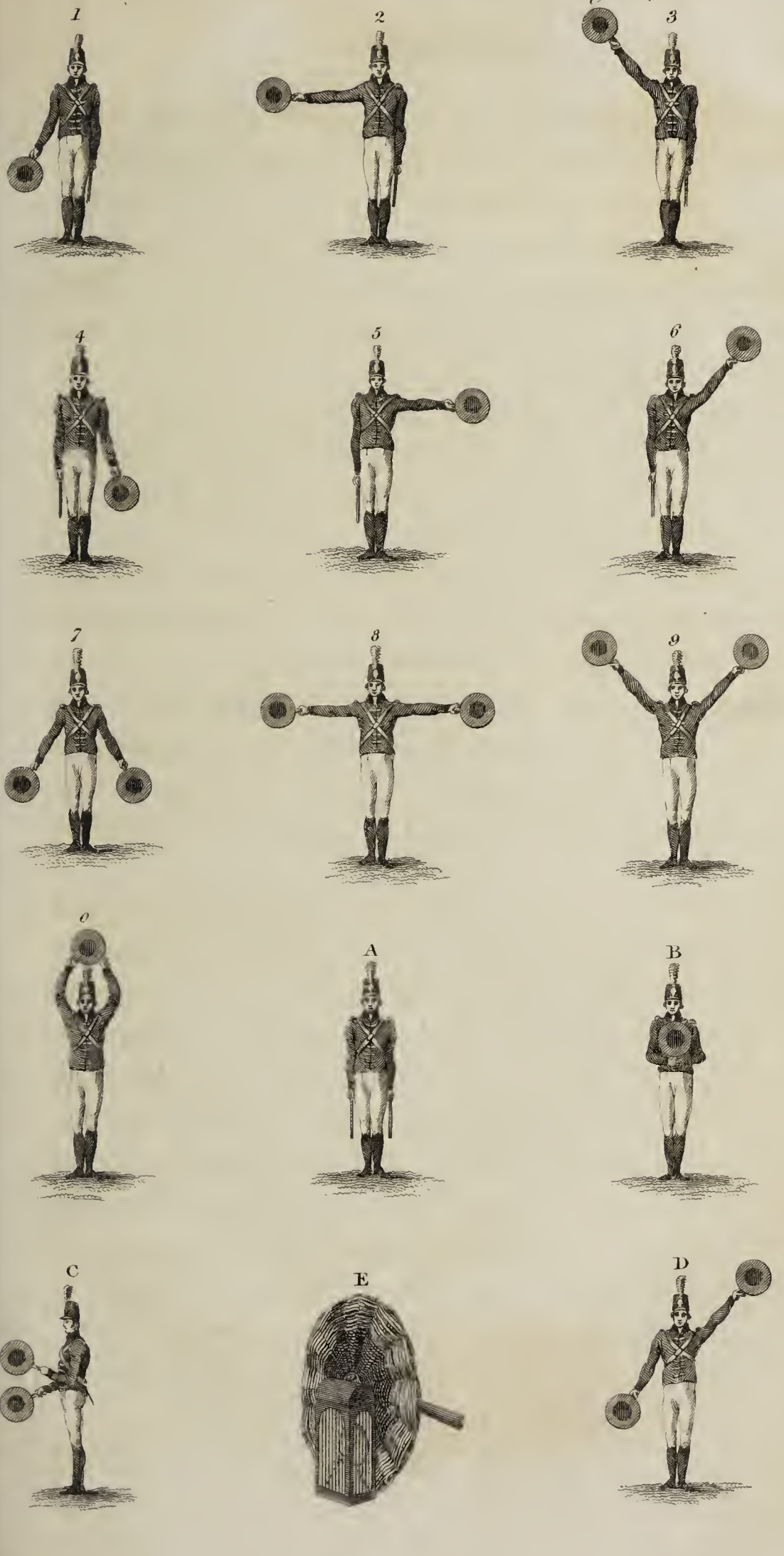
C represents the signal of communication, and is made (when you wish to convey intelligence to your corresponding station), by the telegrapher facing to the right, and displaying one disk over the other.

D represents the signal of error, and must be made whenever the station to which you are communicating has mistook your last signal, for all signals must be repeated to prevent mistakes, and when your correspondent has shown you by repeating the signal of error that he is sensible he has mistook your last signal, you must then repeat your signal, and when rightly answered, you must proceed as before.

When signals are to be made, the telegrapher with a disk in each hand puts himself in the position of "attention," facing correctly the corresponding station; the captain of the station then gives the word of command, "communication," and observing with his telescope when the signal is answered, he then gives the word "down," and the telegrapher immediately fronts, and resumes the position of "attention," always taking care that the edges of the disks are in front, and the captain immediately commences the communication, taking care to give the word "down" as soon as the signal is answered, as for example, "two," "down," "seven," "down," "five," "down," "point," "down," being No. 275.

When

Mr. Spencer's Anthropo Telegraph.



n by J. Farey Junr.

Engraved by S. Porter.

When you have finished your communication or intelligence, you may signify the same by making the signal of the cypher three times, and then "point."

I have lately used the telegraph in making night signals, and found it answer completely. For this purpose I used a lamp-lanthorn, with a reflector of about five inches diameter, glazed with green stained glass suspended upon the breast, and fixed steadily with tapes or strings tied round the body, and two smaller lamp-lanthorns with reflectors about three inches, glazed with common plate glass, one of each is suspended to the centre of each disk by a pin, which allows it to hang perpendicularly in all the different positions and signals, and the difference in the colours of the lanthorns sufficiently shows the angles of each and every signal. One of the disks and lanthorns is shown at E, the lanthorn moves on a pivot fixed in the centre of the disk.

The signal of attention by night is the green light only, the signal of point is made by placing the white light of the right hand disk in front of the green light on the breast, the other on the back as in the day signals.

When the middle stations are used in night signals, the telegrapher at such station must have a green light to place on the back, and two other white lights to be placed on each side of the disks.

The lamp-lanthorn shown upon the disk at E, is one that I have used for this purpose, and is the construction which appears to me the best.

I am, Sir,

Your obedient servant,

KNIGHT SPENCER.

Bromley-Lodge, Jan. 12th,
1809.

To C. TAYLOR, M.D. SEC.

Further

Further Directions for Working the Anthropo-Telegraph on Shore.

THE captain of each station must be furnished with a good telescope, to be fixed so firmly on a stand, as not to be shaken by the wind, and he must be attended by a person to make the signals (called the telegrapher.)

The telegrapher must front very correctly the station to be communicated with, (particularly in making signals by night), and he must take care that the disks when making a signal are displayed full to the front, at other times they are to hang down at arm's length, and the edges of the disks only are to be seen in front.

Stations must be fixed upon where the telegrapher can be distinctly seen from head to foot, and care must be taken that there are no obstructions in front, or objects in the rear, that may confuse the sight from the distant station.

The captain should be furnished with a *velvet paper* book, or journal, and a metallic pencil to take down signals; these are much to be preferred to pen and ink, as the writing cannot be effaced, and one pencil will serve 12 months.

When it is intended to express numbers, either at the beginning, the middle, or end of the question, answer, or communication, it is to be done by making the cypher signal before the number to be expressed, for example,

I want fifty men.
140 476 050 382.

Three hundred cavalry approach my right.
0300 149 78 498 571.

When it is intended to make signals by telegraph, according to Sir Home Popham's dictionary, make the number of the

the letter T, and "point," after the signal of communication, when it is intended to make a *fixed signal*, make the number of the letters FS, and point after "communication."

In making signals on shore by night, it will much facilitate the operations, if the stations are fixed upon before dark, and the telescopes fixed correctly to bear upon the spots to be occupied by the respective telegraphers.

The SILVER MEDAL *of the Society was this Session voted to Lieut.* JAMES SPRATT, *of the Royal Navy, now resident at the Signal House, Teignmouth, for his Invention of a Homograph, or Method of Communication by Signals, on Sea or Land.*

An Explanatory Engraving is annexed with his Explanation of the Method of making the Communication.

SIR,

WITH this you will receive a truly ingenious invention of Lieut. James Spratt, of the Royal Navy. This gallant officer in the glorious action of the combined fleet at Trafalgar, on 21st October, 1805, was on board his Majesty's ship Defiance, when engaged within pistol shot with a French 80-gun ship called L'Aigle, he plunged into the sea, swam to the enemy's stern, and entered the gun-room port alone, made his way courageously through the different decks, and succeeded in mounting the enemy's poop, where placing his

hat

on the point of his cutlas, he called out to his men to join him. In attempting to haul down the French colours, he was attacked by several of their grenadiers, whom he repulsed with success. He was soon followed by several of our jolly tars, and in the act of saving the life of a French officer who cried out for quarter, a musket was levelled by a Frenchman at his own breast, which he fortunately struck downwards, but his leg was fractured by the shot; he afterwards fought two of the enemy on his knees, who were quickly dispatched by his companions, and the French ship soon after struck. More particulars of this transaction are recorded in the XV. volume of the Naval Chronicle, page 193. I have the pleasure to add, that Lieut. Spratt after a tedious illness, has recovered the use of his leg, and now has the command at the signal post at Teignmouth, anxiously wishing to be again employed in more active service against the enemies of his country.

I have taken the liberty of sending this communication, and the account of his invention, unknown to him, knowing that the Society of Arts, &c. are generally disposed to encourage merit in every rank and situation wherever found.

M. S.

September 19th, 1808.

To C. Taylor, M.D. Sec.

Reference

Reference to the Engraving of Lieut. Spratt's Homograph. Plate IX. Fig. 1. ABCD.

This new, easy, and useful code of signals is to be performed with a white pocket-handkerchief, to be held in different positions with the body. Figure A, with the dotted lines, exhibits the whole of the numeral homograph signals at one view, (see the positions that the handkerchief is held in, and the figures marked). The first position from the right foot to the right hand is No. 1, the others No. 2, 3, 4, 5, 6, 7, 8, 9, and 0, follow in succession. When making 1, 5, 9, and 0, the handkerchief should be held by the diagonal corners, as generally prepared for wearing round the neck.

For making 2, 3, 4, 6, 7, 8, the opposite sides of the handkerchief should be gathered in each hand, the near extremity of the hankerchief to be held by one hand to the point of the shoulder.

In working the homograph the body should be erect, the positions steady, the handkerchief to be held well in front of the arms, and facing the person to whom you are to impart your intentions. The best place for showing signals from a ship, is in the chains, or on a lower deck port, as the white handkerchief exhibits a greater contrast with the black sides, and is of course better discerned.

When on shore, they should be made from the side of a green hill, or in front of some thick foliage, or hedge, or dark wall. The positions intended to compose the number of signals, should be made in succession. The person to whom a signal is made, should wave his handkerchief horizontally, to convince you that it is understood.

When the positions which compose the number of your signals are finished, you are to wave your handkerchief in

like manner. For example, persons who make use of the homograph, should arrange in their separate books, or from a telagraphic dictionary, every question and answer which may occur to them on any subject, as there is no limitation to the numbers. If the number prefixed to your communication be 1,000, you are first to make position No. 1, and keep it so until your consort answers it by waving his handkerchief, which informs you that it is understood, then you are to make the 0 three times distinctly, as shown at figure A, each 0 to be kept up until answered as before. Now your signal being made, wave your handkerchief, which informs your consort, that he is to refer to his book for the purport of the signal No. 1,000, which may either refer to a distinct word in dictionaries numbered alike, or to a whole sentence in conversations, premeditated and inserted in books formed for the purpose.

When you wish to commence a communication by signals, you are to display the handkerchief in the manner shown at fig. B, which is called the signal of attention, and your consort is to display his in return. The person who displays first, has a right to begin the communication, and to prevent confusion, it is to be displayed at the commencement of every signal.

If by any accident your attention should be called off, and you did not comprehend the whole of a signal, by holding the handkerchief as in fig. C, you may demand a repetition. This signal is called the repeat. Fig. D, shows the following signals, by twisting the handkerchief regularly round one of the arms, and holding it in one of the positions marked 1, 2, 3, 4, viz. No. 1, affirmative; No. 2, negative; No. 3, interrogative; No. 4 to annul.

SIR,

SIR,

I ACKNOWLEDGE the receipt of your letter respecting my homograph, and beg leave to express the high sense I entertain of its having been noticed by so distinguished an institution as that of the Society of Arts, &c. I am positively the first inventor of it, and I put it in execution at the commencement of this war, on board his Majesty's ship Defiance, commanded by P. C. Durham, who did me the honour to express his approbation of it, and promised to bring it to the notice of his Royal Highness the Duke of York; but having the honour of getting a fractured leg in the battle of Trafalgar, I was prevented from getting attention to my homograph.

I have frequently conversed in this manner with my messmates at Spithead, from the green ramparts at Portsmouth, and from Plymouth Sound to the Hoe, which is still a greater distance. The conversation may be carried on at the distance of four miles by a common telescope.

The various uses to which the homograph may be applied at any moment, without expense, will not fail to attract the notice of persons of discernment. In active military service it will be found very important. It will be found useful to naval captains lodging on shore, who may thus communicate any orders with ease and accuracy to the commanding officers of their ships at anchor. Passengers on board ships in fleets may keep up a constant and friendly intercourse, to console themselves for the tediousness of a long voyage; and the country gentleman may, at a moment's warning, summon his neighbours to the sports of the field, or to the hospitable board.

If my homograph should meet with the approbation of

the Society of Arts, &c. and tend to the good of the community at large, I shall be highly gratified.

I have the honour to be,

With respect and esteem,

Sir,

Your humble servant,

JAMES SPRATT.

Teignmouth Signal-Post,
Dec. 26th, 1808.

To C. TAYLOR, M.D. SEC.

The following Certificates were received from LIEUT. GLANVILLE, R.N.; LIEUT. TAYLER, R.N.; Mrs. SPRATT, of Burlington-House; and MISS TAYLERS, daughters of the Mayor of Devizes.

(No. I.)

I do hereby certify, that being at Ryde in the Isle of Wight in the summer of the year 1806, I frequently conversed with Lieut. Spratt, by means of the homograph invented by him; and previous to the battle of Trafalgar, Lieut. Spratt conversed in this way with many officers at Gibraltar. I also certify, that I have heard from officers of the Brest, Cadiz, and Mediterranean fleets, that Lieut. Spratt was the inventor, and the first person who made use of such invention. Given under my hand this 10th day of Jan. 1809.

J. N. TAYLER,

Lieut. of his Majesty's Ship Spencer.

(No.

(No. II.)

We the undersigned do hereby certify, that being at Ryde in the Isle of Wight in the summer of the year 1806, we did frequently see Lieut. Spratt of the Royal Navy, conversing from the shore by means of the homograph invented by him, with Lieut. J. N. Tayler, then on board his Majesty's ship the Leopard, lying at Spithead. ANN TAYLER further saith, that she with many others saw it used with great success at Teignmouth.

Witness our hands, Feb. 2d, 1809.

MARY TAYLER,
ANN TAYLER,
MARGARET SPRATT. } Devizes, Wilts.

(No. III.)

This is to certify, that I, GEORGE GLANVILLE, Lieut. of the Royal Navy, saw Lieut. Spratt, then Master's Mate of the Defiance, conversing by means of a homograph from the ship Defiance, with Lieut. Nicholas on board the Malta, six or eight months previous to the Trafalgar action, and that they seemed perfectly to understand each other by the signals given.

Witness my hand this 30th day of May, 1809,

GEORGE GLANVILLE, Lieut. R.N.

The SILVER MEDAL *of the Society was this Session voted to* RICHARD WHITE, *Esq. of Essex-Street, for his Invention of a File for Receipts and Letters. The following Communication was received from him, and a File upon this Construction is placed in the Society's Repository.*

SIR,

I SEND herewith the model of a file for papers, which I think will be found preferable to any in common use. A voucher cannot be disengaged from the common file, without defacing it by cutting it off, or by removing many others to get at it; and to return it to its proper place is attended with more trouble and inconvenience. All this is avoided by the contrivance in the file now sent, the wire of which is passed through a cylinder, and fastened by a screw at the bottom.

When a particular paper or voucher is wanted, remove those which are above it from the cylinder upwards to the wire, which is first to be disengaged by unscrewing it, the paper sought for will then be the uppermost on the cylinder, and of course easily taken off; when that is done, return and fasten the wire as before, pressing down the papers from the wire to the cylinder. To return the voucher, the same operation is to be repeated, and the voucher restored to its proper place.

I am, Sir,
Your very humble servant,
RICHARD WHITE.

Essex-Street, Dec. 29th, 1808.

To C. TAYLOR, M.D. SEC.

Explanation

Lieut.ⁿ Spratt's Homograph.

Fig. 1.

Mr. White's improv'd Letter File.

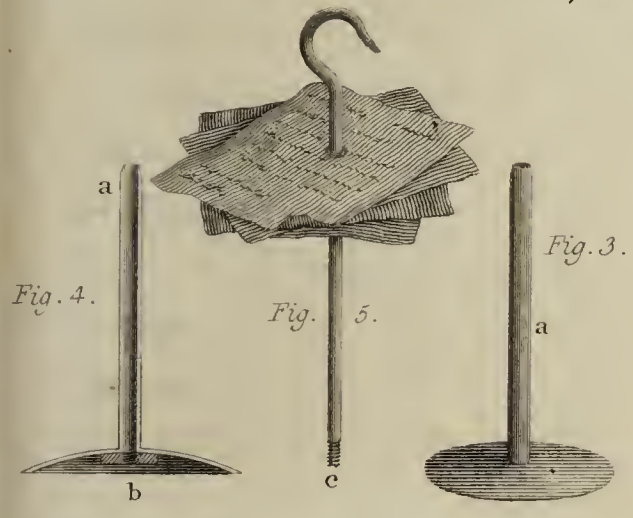


Fig. 4.

Fig. 5.

Fig. 3.

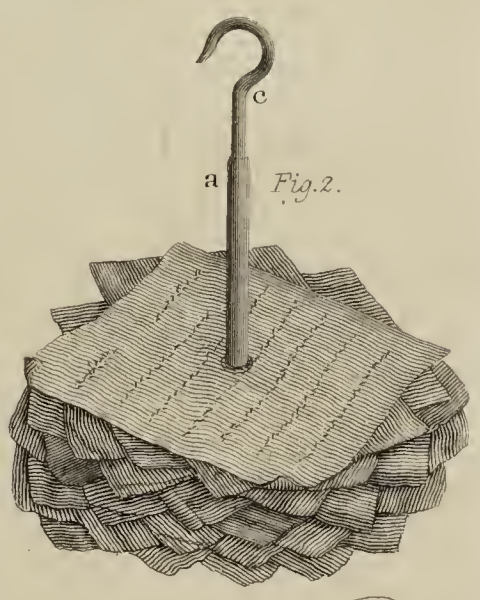


Fig. 2.

Mr. Warren's engraved Slates to teach Writing & Arithmetic.

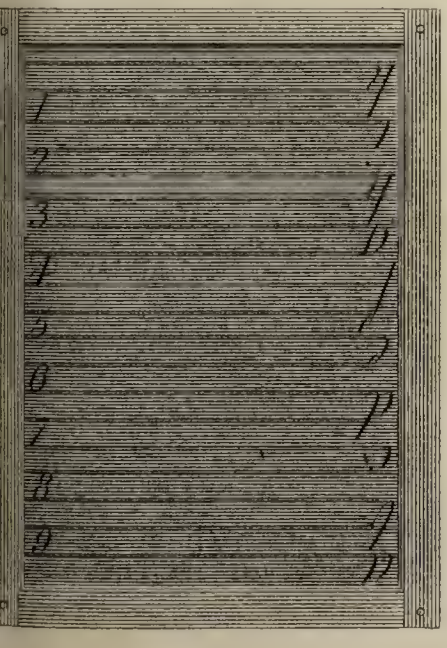


Fig. 6.

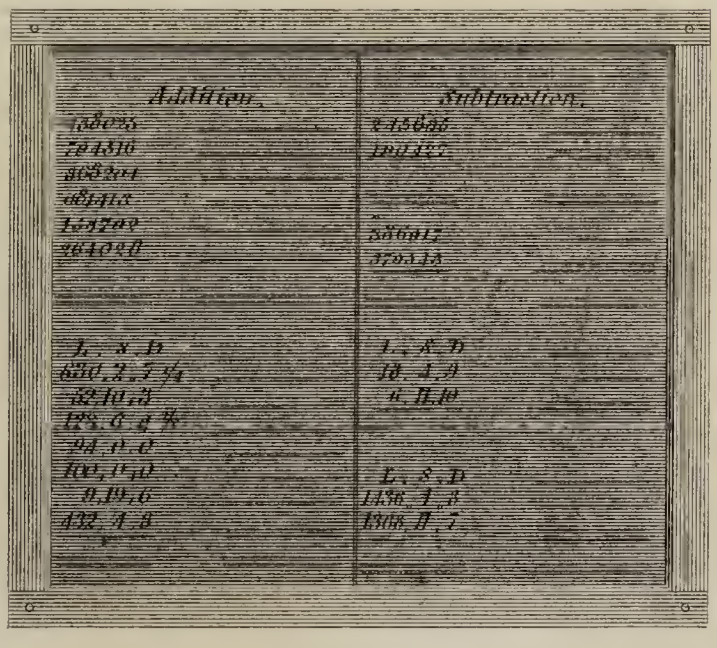


Fig. 7.

wn by J. Farey Jun.r

Engrav.d by S. Porter.

Explanation of Mr. White's improved Letter File, as shown in Plate IX. Figs. 2, 3, 4, 5.

This invention consists of a metal tube *a*, fig. 3, with a convex circular plate soldered to its lower end, to keep the papers from slipping off the file, and having attached to its under side a piece of metal *b*, fig. 4, with a screwed hole in it, to receive a screw on the end of the wire *c*, fig. 5, the other end of the wire being formed into a hook, sharpened at its point, to receive the papers as usual; when any paper is wanted to be taken off the file, (instead of taking off those above it, which cannot be replaced again without much loss of time and trouble, or which is still worse, tearing it off) the uppermost papers are to be slipped up towards the top of the wire *c*, which must be unscrewed, and with the papers upon it removed, as shown in fig. 5; the paper wanted may then be taken away, the wire replaced again into its tube *a*, and screwed fast, and the other papers drawn down the tube as before. The upper end of the tube *a* should be made conical, and its edges sharp, the better to suffer the papers to pass over it. A section of the tube and female screw *b* beneath is shown separately at fig. 4. The papers are shown in fig. 2, in the situation they are commonly placed upon the cylinder, with the wire within the cylinder.

The SILVER MEDAL *of the Society and* TEN GUINEAS *were this Session voted to Mr.* THOMAS WARREN, *Jun. of Buckingham-Street, Adelphi, for his Invention of Teaching to Write on a cheap plan, by means of Copies Engraved on Slates.*

The following Communication was received from him, and Slates Engraved with various Letters, Figures, and Designs, are reserved in the Society's Repository.

SIR,

I BEG leave to offer some engraved slates of my invention to the inspection of the Society for the Encouragement of Arts, Manufactures, and Commerce, humbly submitting to their consideration, whether they may be deemed worthy of reward.

The great utility of this article in instructing the children of the poor, particularly in the art of writing, has been amply proved in several respectable charity-schools at Bury St. Edmunds, also in many private families for the last nine months.

This invention occasions great saving in writing-paper, pens, ink, and labour in teaching.

In making use of these slates, the slate pencil is recommended to be placed in a quill, and to be held exactly after the manner of a pen, by which means the hand is made pliant, preparatory to the use of that instrument on paper.

Small Slates without capitals, which are the sort recommended to schools in general, are sold for fifteen shillings the dozen, by one of which all the children in a family may learn

learn to write, and with care it will last for ages. Small Slates, with capital letters, are sold at one guinea the dozen. They may be procured on my account from Messrs. Champante and Whitrow, Stationers, Jewry-street, Aldgate; and Messrs. W. and C. Child, Lower Thames-street.

The method I recommend in making use of my small Slate, with the two addition sums engraved upon it, is to cut off with the pencil the three lower lines for the first sum, then four lines, then five, &c. by which means the two sums answer the purpose of many; I have proved this Slate to be of great use in schools. The large Slate, with the first four rules of arithmetic engraved upon it, I recommend as a useful article in private families, as by it children may be exercised in those rules with very little trouble.

An addition sum may be cut upon a Slate, to do for the purpose of addition, subtraction, multiplication, and division, by setting the lines at a considerable distance from each other, and making the upper lines the largest numbers for subtracting, but it makes rather a complex article, and examples for children cannot be too plain.

I have prepared some Slates with designs engraved upon them for learning to draw from, but I do not consider this as a very important article.

I should have been happy to have attended personally upon the Society, but through confinement in business and my small means, I have taken the liberty to send the Slates by a friend.

I am, Sir,

Your humble servant,

THOS. WARREN, Jun.

Bury St. Edmunds,
Jan. 4th, 1809.

To C. Taylor, M.D. Sec.

Certificates

Certificates were received from Mr. JOHN POWELL of Islington, and sixty other respectable persons, stating that they think Mr. Warren's Invention is likely to prove of considerable public utility.

Reference to the Engraving of Mr. Warren's Slates for teaching Writing and Arithmetic. Plate IX. Figs. 6 and 7.

Fig. 6 represents one of the smaller Slates, on which the numerals 1 to 9 are engraved on the Slate; faint horizontal parallel lines are drawn across the Slate, within which the scholar is to copy with a Slate pencil the figure at the beginning of that line; he may at discretion proceed to copy one figure in the different lines on the Slate, or to copy each figure in each line. When the lesson is completed and examined by the master, the figures made by the scholar with the pencil are rubbed out, and he proceeds with a second lesson as before.

By reversing the Slate, the small letters of the alphabet will serve for lessons in a similar manner.

Fig. 7 shows one of the larger Slates with examples in addition and subtraction, these lessons may be varied at the pleasure of the master, by the methods pointed out in Mr. Warren's preceding letter.

The master of a large school may have each Slate engraved in different figures, by which means an infinite variety of lessons may be furnished.

FIFTEEN GUINEAS *were this Session voted to Mr.* J. BROCKBANK, *of Whirlpipin, near Whitehaven, in Cumberland, for an ingenious Machine for making Slate Pencils.*

The following Communications were received from him, an Explanatory Engraving is annexed, and a Model of the Machine is preserved in the Society's Repository.

SIR,

IN the month of July last I introduced myself to you at the Society of Arts, &c. for the purpose of exhibiting some specimens of what I believed to be be a new and ingenious manufacture. I then requested your advice respecting the proper mode of bringing the invention before the Society, and if it met their approbation of procuring some gratuity, honorary or pecuniary, for the inventor. In compliance with your information, the inventor has constructed a model of the machine, which will fully illustrate to the Society on a small scale its mode of operation on the larger one of the mill he has lately erected.

To place the claims of this invention in their proper light, it may not be improper to state the causes which first led Mr. John Brockbank, the inventor, to turn his thoughts to the construction of this sort of machinery, and to erect a mill for the purpose of making slate pencils. The specimens which accompany the model now sent will be convincing proofs of its efficacy, and of the superiority of his pencils over all others hitherto manufactured.

In the vicinity of Mr. Brockbank's residence on Black Combe, a lofty mountain in the seigniory of Millom Cumberland,

berland, there is an almost inexhaustible quarry of that species of shale or shiver, peculiarly adapted for this purpose. Having proved this, and being informed that an immense quantity of such pencils were annually imported into this kingdom, under the name of Dutch pencils, he conceived the idea, that the intervals of leisure which his occupations in husbandry allowed him, might be profitably employed, if he could discover some mode of manufacturing pencils that should rival in cheapness, and excel in other respects, those procured from foreign markets. I have no doubt you will agree with me in thinking, that in the outset this did not seem an easy undertaking, but it has nevertheless ben executed with complete success, more particularly when the cheapness of the imported pencils is considered. The encouragement the sale has met with wherever they have been tried, namely in a few of the large towns in Cumberland, Westmoreland, and Lancashire, soon occasioned a greater demand than the inventor was able to supply, whilst the power of the machine was only impelled by the hand. At that time the long pencils were sold at ten shillings, and the short ones at five shillings per thousand, and he was able to make about twelve hundred of the two sorts per diem.

Now that the machinery is worked by water, no greater rapidity of execution is acquired, but it is no longer a work of much bodily exertion, and may be managed by boys; so that if he continues to receive encouragement, he may be induced to extend his machinery, by the addition of more frames, to a larger water wheel, so as to answer the most extensive demand. Humble as this species of manufacture may at first be thought, yet much might be said to show that it has stronger claims to attention than a superficial view of the price and nature of the article might suggest. There

is

is a great and constant demand for such pencils in every village of the kingdom; and that demand has hitherto been supplied by importation from foreign markets. Perhaps any further remarks of mine may be unnecessary on this subject. I have only briefly stated the grounds upon which the inventor respectfully solicits attention, he being fully aware, in his remote situation, that nothing is more likely to aid his views, by calling the public attention to his manufacture, than the honourable notice of the Society instituted for the Encouragement of Arts, Manufactures, and Commerce.

If the Society should wish for any additional information respecting the machinery and its operation, more than what the description accompanying the model conveys, I beg leave to refer them to Mr. Miles Brockbank, Coopers'-court, Cornhill, who has seen the machine at work, and can give every information respecting its power and execution.

I remain, Sir, with great respect,

Your most obedient servant,

JAMES SATTERTHWAITE,
Rector of Whicham.

Bootle Rectory,
March 1, 1808.

To C. Taylor, M D. Sec.

SIR,

Please to have the goodness to observe, that my present machinery is worked by a water-wheel of only seven feet diameter, fixed on one end of the axis; a small lever, projecting from the axis, presses down the jaws of a pair of pincers, the lower handle of which pincers is fixed stationary below

below the axis above-mentioned, and the upper handle is alternately pressed down by the lever, and raised by a crank at its extremity, which is counterbalanced by a weight above it. These pincers first cut the shale or shivers into proper lengths or slips, which slips are carried from thence, and one by one entered into the end of a circular sharp-edged tool or tube, something resembling that with which sadlers punch holes in leather; they are forced through this by means of another lever fixed in the axis of the water-wheel, which alternately presses forward the frame sustaining the pencil, and draws back the frame after such pressure by means of a wedge and wheel fixed upon another axle. The pencils are made in a circular form by their pressure through the hollow tube above-mentioned. I have sent specimens of the materials and pencils, in their different stages of work, to explain the business fully.

I am, Sir,

Your obedient servant,

JOHN BROCKBANK.

Whirlpipin, in Whicham, near Whitehaven, May 1, 1809.

To C. Taylor, M.D. Sec.

Description of Mr. Brockbank's Machine for manufacturing Slate Pencils.

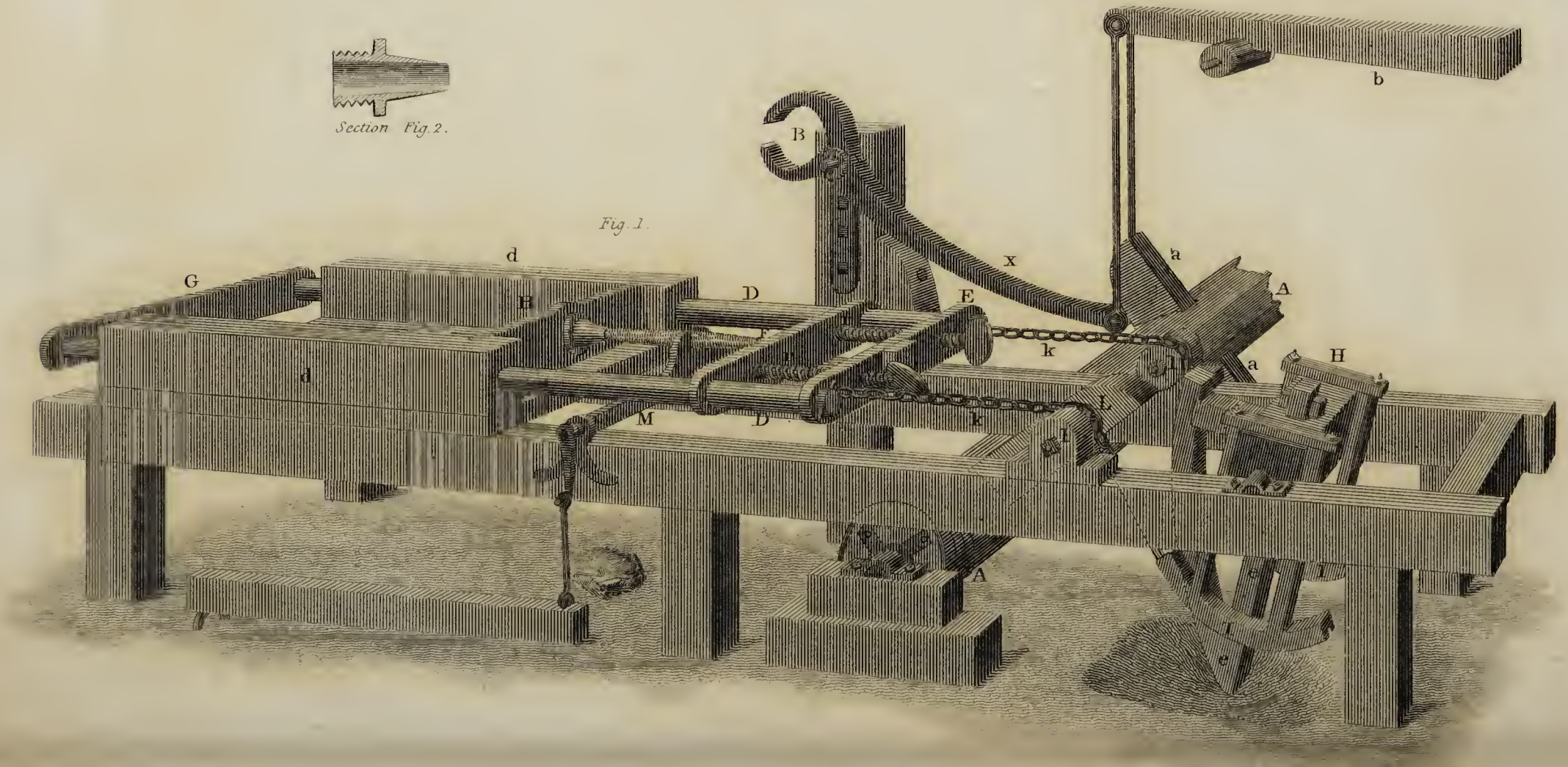
Mr. Brockbank's machine is shown in perspective in Plate X, where AA is the axis or shaft of a water-wheel, which gives motion to the machinery; *aa* are two cams or tappets projecting from the axis to work the nippers or pincers B; the lever *x*, which is part of the lower jaw, is lifted up by two rods, which connect it with a heavy lever or counter-

balance

Mr. Brockbank's Machine for making Slate Pencils.

Section Fig. 2.

Fig. 1.



balance *b*, and by this means the nippers are opened; the upper jaw is fixed to a post firmly placed in the ground; as the water-wheel revolves the cam *a* alternately presses down the lever *x*, and closes the nippers, and when the cam *a* has passed by, the weight of the lever *b* opens them again. L is another cam, much larger than the former, (fixed into the same shaft AA), for giving motion to the other machine: DD are two cylindrical rods, connected by the cross pieces EFG, which form a frame; the rods DD slide through holes or sockets in two beams *d d*, fixed to the frame of the machine; between these two beams an iron plate H is fixed, having a hole in the middle to receive the screw of the the cutting tube shown in section in fig. 2. The frame is pushed away from the axis A by the cam L meeting the cross-bar E of the frame, and it is brought back again by the cam moving a crooked lever *eee*, which is fixed on an axis H. II are two arcs of circles of segments of wheels, fixed on the same axis H; two chains *kk* are fastened to these, and passing over two pulleys *ll*, are fastened to the front piece E of the frame; by these chains the motion of the crooked lever *e e* is communicated to the frame, so as to draw it back ready for the next stroke of the cam L. M is a cross-bar moving upon two centres, having a notch or gap in the middle of it, for one end of the shiver or piece of slate to rest upon; at one end of this bar is an arm, to which is hooked one end of a beam or weight, the other end resting upon the ground; the frame in its action presses down this cross-bar, but it is again replaced in its upright position by the action of the weight upon it.

The materials intended to make the pencils are laid in a convenient place, the person employed generally sitting to the work. In the first operation of the mill, the pincers B very expeditiously pinch or split the materials into slips or lengths,

lengths, from thence they are received by a person standing to attend the frame, and between the frame and the pincers, one of the points of the slips or lengths, so split or pinched by the pincers, is put into the cutting tube, and the other end rested in the notch of the cross bar M, the revolution of the water-wheel now forces the frame forward and forms the pencil, by thrusting the slips or lengths before-mentioned through the cutting tube (which should be made of excellent steel), which is screwed into H, the chips or refuse slate falling down under the cutting tube. The pencils are then in their second stage, and in order to reduce them to a proper size, the first cutting tube is unscrewed or taken out, and another the size of the intended pencil is fixed in its place, they are forced through this smaller cutting tube by the same operation as before, and the slate pencil is then completely finished, of a beautiful cylindrical form, ready for use.

The two screws *r r*, which either advance or draw back the cross piece F, are to regulate the forcing frame, that all the pencil may be forced through the cutting tube, when the cam L upon the water-wheel axis AA leaves the forcing frame. The water-wheel of the mill is only 7 feet diameter, yet it has sufficient power to work both the pincers and the forcing frame at the same time.

The

The SILVER MEDAL *of the Society was this Session voted to Mr.* ROBERT SALMON, *of Woburn, for his Invention of a Machine for securing Persons attempting Depredations, without affecting their Life or Limbs.*

The following Communication was received from him, an explanatory Engraving is annexed, and one of the Machines is reserved in the Society's Repository.

SIR,

I BEG leave to submit to the Society of Arts, &c. a Man-trap, which I hope will meet with their approbation. To those who live in the country it is needless to explain the frequency of petty depredations committed on gardens, orchards, &c. and which are sometimes very vexatious. Few persons would like to endanger the life or limb of the depredator by setting the common steel man-trap, yet it is presumed there are but few who would not wish to detect the offender. The instrument which I have the honour to submit to the Society is for the purpose of catching and holding the person without injury. At the Agricultural Meeting at Woburn last summer, an ingenious invention for a similar purpose was produced by Sir Theophilus Biddulph; it consisted of a wood box, containing two springs in iron barrels, and two chains passing over and round them; when this was set, the chains were withdrawn from round the barrels and extended to a certain distance. A trigger then kept the trap from closing, the whole was then covered over with thin iron plates, so that if a person set his foot on those plates his leg dropped into the box, and the chains closed round it

and held the leg; but as the box was about three feet square and a foot deep, it was requisite that it should at setting be let into the ground, which would be a work of considerable labour, and when done it would be difficult to dispose of the stuff from the hole, or to conceal the trap, and as the whole apparatus was cumbersome and expensive, it appeared to me not to be well applicable in practice.

I think it right to give this explanation in justice to Sir Theophilus Biddulph, from whom my idea of the utility of something of the kind arose, as also to show the difference between his invention and the trap I have made, which is so very simple as hardly to require explanation. When set it only requires that the two keys be withdrawn, and that the trap be covered with a few loose leaves or mould. To the trap I have attached a piece of chain and a screw to be screwed into the ground, so as to prevent its being carried away; but against any person that may be caught such a precaution is perhaps unnecessary, for any person who is caught will find the jaws of the trap close so fast on the leg that he cannot drag the trap far without great pain, and will consequently be glad to stand still and to call out for relief. For the convenience of explanation I have applied mufflers to the jaws of the trap, so that any person may put in his leg without the least inconvenience. I have even tried it without, yet, though void of danger, the sensation is not pleasant. The muffle will of course be omitted when set for use, as it is not then necessary to guard against a little inconvenience, otherwise the springs might be made weaker.

I remain, Sir,

Your most obedient humble servant,

ROBERT SALMON.

Woburn, Feb. 12, 1809.

To C. Taylor, M. D. Sec.

P. S. Permit me strongly to recommend to the notice of the Society the earth screw attached to the trap, as excellent for the purpose of fixing any thing steadily in the earth, this screw is far superior to the common way of driving an iron point or stake therein.

I have employed it for several years in fixing cross-staffs and other surveying instruments with great advantage. The very act of driving a spiked instrument into the earth leaves it loose with some play or movement, which prevents it from being easily secured; but with a screw of this kind at the bottom of the instrument it is firmly fixed in the ground, and a turn of the screw will again fix it, if it should by any means be moved or loosened. It may also be screwed into the ground with any instrument upon it, which would be spoiled by the act of driving it in.

Description of Mr. Salmon's Man-Trap, which detains the Offender, without injuring or maiming him. See Plate XI. Fig. 1.

The principal figure in the fore-ground of Plate XI. is a perspective view of this machine. Fig. 1. ABC is a frame of wrought iron, about 18 inches square; it has an eye projecting from it to receive a short chain, the other end of which is fastened to an iron screw, shown separately at D, screwed into the earth by the key or handle E; this screw is about 14 inches long, and, when screwed into hard ground, will hold so firmly, that there is no danger of its being drawn out, even by two or three men, and having a small square end, it cannot be turned without the key or handle E; so

that an offender would find it extremely difficult to remove the trap: *e e f g* are two iron frames moving on centres in the frame ABC; these frames have a constant tendency to close together, by means of two springs *p p*, fixed in the frame AB, and acting against pins projecting from the upright sides of the moveable frame *e e*; *k k* are two small iron rods jointed to the upper rod of the moveable frame *g*, and passing through small locks *l l*, fixed to the other frame *f*. These locks contain clicks which are pressed by springs into the teeth, as may be seen upon the rods *k k*, so as to prevent the two bars *f g* from being drawn asunder when they have been closed by means of the springs *p p*. The internal mechanism of the locks is explained by figures 2, 3, on a larger scale at LM, in the same plate; one side of the lock is supposed to be removed to exhibit its interior parts, where *k* represents the rack, or that part of the rod which is cut into teeth, *r* is the click, which engages the teeth of the rack, and prevents its being drawn through the lock: the click is pressed against the teeth of the rack by a spring, which is plainly seen in the figures; the locks are attached to the ends of the bar *f* of the moveable frame, by the bar passing through the locks, and when the lids are rivetted on it is confined in such a manner that it cannot be got out. But as it is necessary to open the bars *f g*, and draw the clicks back from the teeth of the racks, Mr. Salmon has contrived two different methods of accomplishing this object. Figure 3, M is that which is used in the model left at the Society's Repository, a small key or screw S is put down through a hole in the lid of the lock, and is received into a hole lapped with a screw in the click: by turning the screw it lifts the click out of the teeth of the rack; so that the moving frames *f g* can be opened apart from each other, till they lie flat upon the frame AB. The iron cross *m* is then put between the two rods *f g*, the screws

S of

S of the two locks are to be withdrawn from the locks, and the trap is set for use. If an offender should place his foot within the square of the frame, he would tread down the cross *m*, and having thus removed the obstruction, the two frames *e e f g* are closed together by the springs *p p*, so that the bars *f g* inclose his leg, and the clicks in the locks prevent the bars being opened without the screws S. In some of the machines which Mr. Salmon has made since the model was deposited with the Society, the locks are made like figure 2, L, where a common key is to be introduced, and, when turned round, catches the tail of the click; it may have wards to prevent the using of a false key, though no wards are shewn in the plate. Part of the screw D for securing the trap from being carried away by depredators, is shewn on a larger scale at N, in order that the peculiar form of its threads may be better seen, which fix it firmly in the earth. Such screws would be very serviceable in fastening horses at grass, &c.

TWENTY GUINEAS *were this Session voted to Mr.* ROBERT SALMON, *of Woburn, for a Method of constructing commodious Houses with Earthen Walls.*

The following Communication was received from him, Explanatory Engravings are annexed, and Models of the Apparatus are reserved in the Society's Repository.

DEAR SIR,

HAVING for some years past practised at this place the art of Pisè, or constructing walls with earth, and having in

consequence been several times, both publicly and privately called on to communicate my observations thereon, I have been led to consider that the best mode of generally communicating what I know on the subject would be through the medium of the Society of Arts, &c. I have accordingly, by the waggon, forwarded a case containing a model of my frames and apparatus for performing the work, with every particular in my power to give, for the information of any persons inclined to build in that way, and they will I hope, be found worthy a place in the collection of the Society.

To such as may be inclined to see specimens of this work, and may not have an opportunity of going far distant from London, I can recommend a house and other works built, and some of them inhabited by my brother, Mr. William Salmon, Builder, at Henley-Hill, near Barnet, Herts.

I have the honour to be,

The Society's, and your most obedient Servant,

ROBERT SALMON.

Woburn Park, Dec. 8th, 1808.

To C. Taylor, M. D. Sec.

Description of the Engraving of Mr. Salmon's Method of building Pisè or Earthen Walls.

Fig. 4. of plate XI. is a perspective view of the apparatus or moulds, in which the earths are rammed to form a wall. The mould consists of two long planks F*f*, twelve feet long, twenty inches broad, and one inch thick, each made in two breadths; they are strengthened by several pieces of wood nailed across them. Holes are made through these pieces

pieces of wood at top and bottom, to receive iron bolts, which hold the two boards parallel to each other, fourteen or sixteen inches asunder, which is the thickness of the wall intended to be formed between them. The bolts have a large head at one end, and a key passes through the other, to keep the planks together. When a wall is to be built, the foundation is laid in brickwork, which is carried about nine inches above the ground, upon this brickwork the planks are placed and bolted together. Two boards, like that shown at G, are placed between the planks at the ends, to form the ends of the mould; these boards are placed between the two bolts *a a*, which are seen close together at the end of the moulds, and are held fast by that means; the earth is now to be rammed in between the moulds, by the rammer with an iron head X. When the mould is filled with earth and well rammed down, the keys are to be taken out of the bolts, and the bolts drawn out; the planks are then removed, and put together again, a length further upon the wall, the bolts at the end, being put through the holes left in the wall, only one of the end boards is now put in, and the ramming proceeds as before; in this manner straight walls may be built of any length, and when the lower course is finished, then the mould may be taken to pieces, and put together again upon that course, the lower bolts of the frame being put through the bolt holes, which the upper bolts made in the wall at the first operation, to insure that the upper part of the wall is in the same place, and exactly over the lower. When a wall is to be built thinner than usual, a block of wood must be placed under the head of each bolt, so as to diminish the space between the planks.

When the angle walls of buildings are to be made, the apparatus is put together, as shown in the plate; four of the

planks are put together to form a right-angled mould, one end of each of the planks F and H is furnished with double bolts, the other ends have each two eyebolts fixed into them, as shown separately at *b d*; then a bolt *n* connects the two moulds, so as to form a hinge; the planks are kept together, so as to be perpendicular to each other, by a long iron rod K, hooked into eyebolts fixed in the planks. The outside planks of the mould are joined together in a different manner, see fig. 5, that of one frame being longer than that of the other, and has two pair of holes through its end O, to receive the bolts *t t*, which are fastened to the ends of the other shorter plank, and the keys are put through the ends of the bolts, to secure the planks together; a piece of wood P is occasionally placed between the end of the short plank and the side of the other, to increase the space between the planks, to make a thicker wall, the two bolts at the end of the plank being received into the notches in the piece of wood, and these bolts are then put through the holes Z Z of the long plank. In building the angle wall, it is necessary that the vertical joint formed between each mould should not be over one another, but arranged in the same manner as the joints of brickwork; this is accomplished by making the lower course of wall upon the brickwork only half the length of the mould, which is done by placing the end board G of the mould in the middle of it. The next course over this is to be made the whole length of the mould, the next one only half, and so on, as shown in the figure.

Improved

Improved Moulds and Description of making Earth Walls, by Mr. R. Salmon of Woburn, Bedfordshire.

The model of the frame in possession of the Society is made to a scale of an inch to a foot, the frame at large is made of $1\frac{1}{4}$ inch deal, ploughed and tongued together. The bolts and pins or keys of iron, as are also the plates on the holes in the sides of the frame. These plates are put to prevent the keys from cutting into the wood, and the holes from gulling and wearing.

This sort of mould is calculated for making walls, either fourteen or sixteen inches thick, and the model (or perspective view of it in the distance of plate XI.) shows how the mould is to be applied for making the corner of a building of the sixteen inch wall; the same moulds may be applied for a fourteen inch wall. *ff* being the outer sides. F H the inner sides. When employed for straight walls, or making good between the corners of buildings, the two returns of the frames are used in pairs, *ff* and F H make two sets of frames. The board marked G must be of width equal to the thickness of walls to be made, and are for the purpose of stopping the earth, and making ends or jaumbs to doors or windows, or wherever wanted. The piece of wood P is two inches thick, and is for the purpose of making out the external sides of the moulds, from a fourteen inch to a sixteen inch wall: by introducing this piece between the two sides *ff*, and putting the fixed iron pins in the outer holes Z Z, and taking away the blocks under the heads of the outer bolts, the sides of the frame will then be sixteen inches, as under, and thereby adapted for a sixteen inch wall. Fig. E are pieces of wood about $1\frac{1}{2}$ inch square, and cut to the length

length of the thickness of the wall, and are for gauges to be applied on top of the bolt, to keep the keys from drawing the sides too close together.

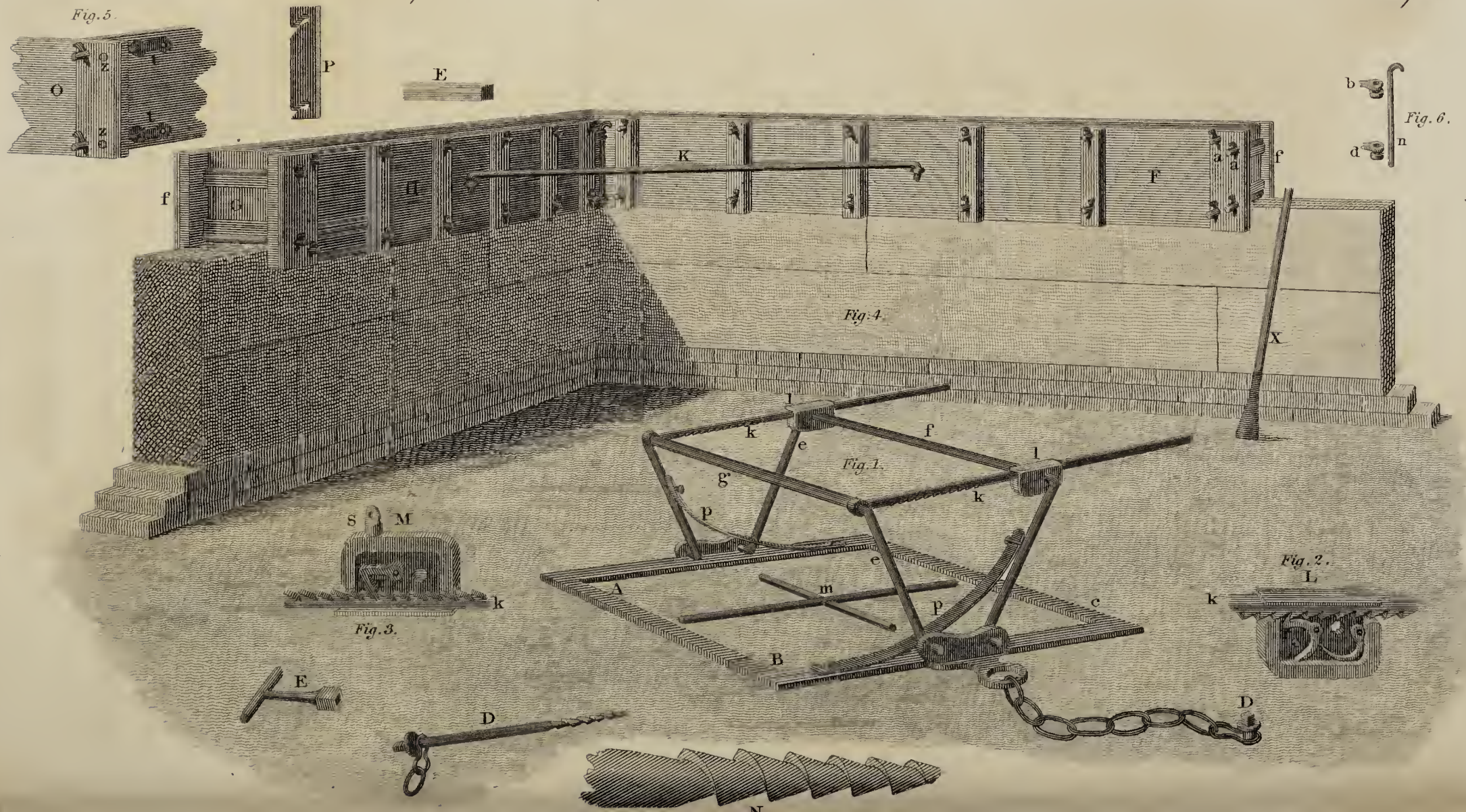
In beginning the wall, some of them are necessary at the bottom, the more firmly to support the frame on the brick or stone work. They are then worked into the wall, and, after the frame is taken down, drove out. After the first course, they are only necessary to the top irons, and may be taken out as soon as the earth is rammed up near them, so that no holes are left in the upper courses of the wall, more than the bolt holes.

When these frames are used, one side is placed in such a direction, that the front or end may be required to be taken away, and then by means of the angular iron brace K, the other return is sure to stand at right angles with the first. Care should then be taken, in the first course, to set the sides level, that being done, the other upper courses, from the nature of the frames, and manner of using them, must of course come upright and level without any particular care, and a wall being properly began, cannot well get wrong. After the first course of a building is done, the moulds should be moved to another, and so on till all the courses are up, and as the top holes of each preceding course become the bottom holes in the succeeding ones, no difficulty will be found in fixing the mould after the first course is properly done.

Fig. 6. shows the iron pin and staples that keep the internal angle of the frame together. K, fig. 4. an iron stay to set the returns at right angles. This is only wanted where other means of setting the building square is not to be obtained.

Having described the frame, and means of applying it generally, it may be necessary to observe the following particulars in the process. Having carried one course round the building,

Mr. Salmon's method of Building Pisé or Earthen Walls — & his Man Trap.



building, it frequently happens that the top thereof becomes too dry to attach to the next succeeding course, and therefore it is advisable that, as soon as the frame is set for the succeeding course, a small quantity of thick grout, composed of $\frac{1}{5}$ lime, and $\frac{4}{5}$ earth, be poured on top of each course, immediately before the first layer of earth is put in. A very small quantity is sufficient, and will add much to the strength of the work, by cementing the courses well together at the joints. The workman should also, with the corner of his rammer, in ramming home to the upright joints, cut down a little of that part of the wall, up to which he works; this will make the upright joints key together, and unite in a solid manner. Having thus proceeded and got up the walls, the next thing will be to stop the bolt holes, with mortar made $\frac{1}{4}$ lime and $\frac{3}{4}$ earth the same as the wall.

The earth proper for this work should be neither sand nor clay, but partaking of both. Clay is particularly objectionable, as is also chalk, or calcareous earth of any sort. Sand is also not proper, unless accompanied with some binding quality: the bolder and coarser the sort of earth the better. When used, it should retain no more moisture than just to make it adhere together, under the pressure of the thumb and finger. Notwithstanding earths bordering on sand appear to make the strongest work, nevertheless good earths may often be found in parts that do not abound with sand. Those that abound with a mixture of grit or fine gravel are generally the best. Having provided proper earth, as much should be put in each layer as to form about an inch and half when compressed by ramming.

The rammer X should not be more than half an inch wide on the edge, in order that it may more forcibly compress every part of the earth, which a flat rammer would not do so well.

In

In making the walls, about three inches in thickness of loose earth should be put in each course, which done, the same, by means of a trowel made for the purpose, is drawn back and cleared from the face of the wall, and the space then filled up with the facing composition, forming on an average about one inch in thickness; the whole then is firmly rammed, (in which, and properly preparing the facing stuff, much depends the perfection of the work,) till it is quite hard, when it will be compressed to about one inch and a half in thickness. The common facing stuff is composed of lime one part, and earth, the same sort as used for walling, three parts. The lime and earth mixed and slacked together, the same as for mortar. The more it is slacked and wetted the better, provided time can be allowed for it again to dry and pulverize, so as to be fit for ramming. The better sort of facing stuff may have a small quantity more of lime in it.

The foundation should be of brick or stone, carried up nine inches above the ground, and if a plinth is to be shown, then one course above the same should be of brick or stone, to prevent the water that might lodge on the plinth from damaging the earth wall.

The proper season for performing this work is any time that the earth is to be procured sufficiently dry for the purpose; the more early in the season the better, in order to give it time to dry before finishing, or if late it would be advisable not to finish till the year after it is built.

Windows and doors may be left in the walls wherever wanted, by fixing the head of the moulds and carrying up quoins to form the same: in erecting which some bond timber should be laid in coarse mortar and rammed in with the earth. Lintols may also be laid at the proper height. This method is cheapest, where only one window or door of a

size

size is wanted; but if many, the readiest way would be to make some rough frames of boards of width equal to thickness of walls, and place them in the situation of the windows and doors. When done the earth is rammed up to them, laying bond timber at the sides and lintols over them. In both cases the windows and door-frames are to be put in their places and fastened to the bond-timber, after the wall is up. The bond timber, lintol and plates, should be kept as thin as possible, in order to prevent any disagreement between the earth and timber in the shrinking or drying of the same. The bond timber about 4 inches by $1\frac{1}{2}$; floor or wall plates 6 inches by 2; lintols about 4 inches thick; and it may be worthy of notice that any slabs or rough stuff may be used, the earth being sure to ram close to it and keep it in place.

For common cottages, when the whole of the walls are up and covered in, the holes should be stopped with very coarse mortar, made the same as the facing stuff, but used wetter, and the wall then lime-washed over with lime and sharp sand, which should be made up in small quantities and used whilst hot. This may readily be done by adding a knob of lime and sand a little at a time as it is used.

For better kind of cottages the better sort of facing stuff may be used, and then, as before, the whole lime-whited; or if it be required to make the finishing as perfect as possible, the following is the best mode, viz. with water and a brush thoroughly wet and soak the face of the wall for two or three yards in superficie at a time; all which part, during the said wetting, should be continually rubbed and worked about with a hand float, till such time the face is rubbed smooth and even, by which the facing composition will so wash up as to become a pleasant regular colour, the face smooth and hard when dry, and not liable to scale off as a coat of plastering

tering would do. This finishing will be still improved by a small quantity of lime being put in the water used for soaking the face, and after the wall is well soaked and rubbed, as above-mentioned, there be thrown thereon with a brush some of the lime and sand, (such as used for lime-whiting,) and that also worked into the face; the face will then become as perfect and hard as stucco.

Having explained the frames as constructed by me for performing earth walling, as also the manner of finishing it, I beg leave to lay before the Society some observations on these, compared with the original French means and manner of performing the same, as described in the first volume of Communications to the Board of Agriculture.

The sides of the frames, as formerly constructed, were supported on joists or cross pieces of timber, which pieces were cut into the top of each course of walling. The sides were then kept together by upright timbers framed into the cross pieces or joists, and the tops of the upright pieces were wristed and held together by ropes going across the frame from one side to the other. In consequence of this construction, by experience I found much labour was lost in cutting the channels to lay the cross pieces in. These channels, after the buildings were up, took labour and materials to fill them in, and rendered the walls less strong. Also the difficulty of getting the frame rightly placed every time it was moved, and the elasticity of the rope across the top, made the whole very imperfect, so much so that all work done in that manner was untrue and unsound; as the rope, however tight it might be strained, would yield to a certain degree. The labour of moving was great, and when the frames were set, the cross ropes and uprights above the sides were much in the way of the workmen.

On examining the model I have the honour to send, it

may

may be seen that these frames being once set true, they require very little care afterwards: being kept together by iron bolts no elasticity can occur, and the earth will be as firmly compressed, as if rammed between two walls. No cutting away for cross pieces is required, nor any holes but the small bolt holes to make good; and as nothing sticks up above the frames, the workman cannot be impeded. In consequence of these alterations the work may be more cheaply and truly executed than with the old sort of frame.

Previously to entering into the expense of this sort of work, on my conceptions as to its advantage, it may be necessary briefly to state from whence such is collected.

About sixteen or eighteen years ago, the late Duke of Bedford directed a foreigner, who was then making some walls in Lancashire, to come and make some specimens here, and wishing to know how far it might be usefully introduced, I was directed to give attention, and every aid to the man employed. Accordingly frames of the old sort were made, exactly like those before described, and with them some specimens being made, the man returned. These specimens I considered were very bad walling, and in attending to the execution thereof, seeing sufficient room for improvement, I was directed further to practise it. Frames were then constructed like the model, and several walls erected, among which were some cottages now standing, and lastly, the house I now live in. This has been built about twelve years, and is a sufficient proof of the utility of the practice: the house being as close, warm, and dry in the walls, as if built of any materials whatever.

With regard to the expense of the walls of this sort, as labour is the principal part of the expense, and as in some places labour is dearer than in others, the best mode of

estimating

estimating it at different places will be from the quantity that a man should do in a day, and which I have found to be $1\frac{1}{4}$ yard superficial, in the common day's labour of ten hours.

At this place the expense may be estimated as follows:

	£.	s.	d.
Labour to making facing composition, fitting in and ramming to a 16-inch wall, where the earth is at hand (labourer's being 1*s.* 10*d.* per day) per yard superficial — — — —	0	2	2
Value of lime used in the composition rammed into the face of a yard superficial (lime being 8*d.* per bushel)	0	0	3
Lime and labour to rubbing up and finishing the outside face of the wall — — —	0	0	3
Total finished and faced on one side	0	2	8
If a wall to a garden or otherways, and finished and faced on both sides, then add — —	0	0	8
Total for walls finished on both sides	0	3	4

At this place the value of a yard of brick-work is more than ten shillings, of walling only 14 inches thick, the bricks being 42*s.* per 1000, and lime 8*d.* per bushel; consequently the œconomy of the Pisè must appear; and the same difference will be found in any other place where lime and bricks bear the same price, and proper earth can be found at hand. But as attempting this sort of work, where it is not applicable, or improperly doing it, so as to lead to failure, may prevent its introduction where it would be useful, I shall endeavour to point out any precautions that have struck me, and every thing that has appeared to make against it.

Many persons have supposed, and it has been asserted, that

that almost any earth will do, but such is certainly very erroneous, for proper earth cannot in all places be found, and it being difficult to describe it, or to be sure when it is found, it seems adviseable, before the entering on any considerable work, that the experimentalist should first do a small piece, and let it stand with the top only covered for a winter at least.

It has before been observed, that the excellence of the work depends on its having due compression, as well as being of proper soil. If the compression be not perfect, although the soil be good, the walls will be unsound; and unfortunately it so happens, that when a wall is built and badly rammed, its imperfection cannot readily be observed, and further, the defect is likely only to be found but by its failure; and hence arises the greatest bar to its general introduction, for as it requires considerable labour to build a wall, it requires exertion to do it in proper season; and if the labourer be employed to do the work by task, it becomes his interest to get on and do it slightly, and if done by day, it will not advance so rapidly; consequently, in either way, it will require great attention from a careful overlooker.

From the foregoing comparative statement of Pisè against brickwork, persons unacquainted with building are inclined to suppose that the whole expense of the building will be in proportion thereto; contrary to this it only affects the walling,—the roof, floor, &c. remaining the same as before, excepting as it may reduce the quantity of bond timber and lime used in plastering the inside; this latter is less than when plastered on brickwork, the face of the wall being so much truer than brickwork.

A working drawing, on a scale of one inch to a foot, is left with the Society, for the inspection of any person inclined to construct the apparatus.

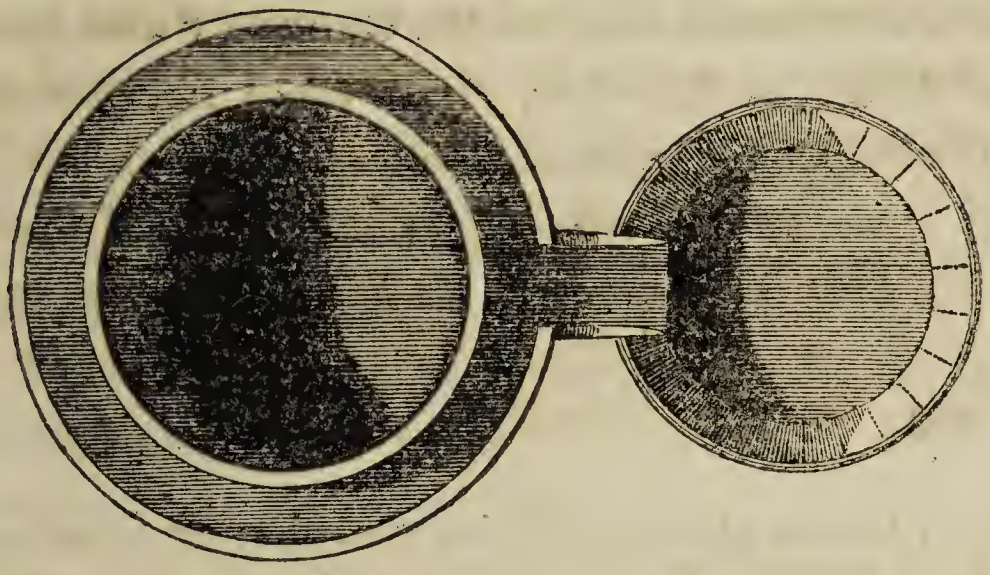
The THANKS *of the Society were voted on the 8th of February*, 1786, *to Mr.* BREAM, *of Yarmouth, for his Present to them of a Model of a Boiler for the Use of Tallow-Chandlers and other Manufacturers of inflammable Matters. Explanatory Engravings on Wood are annexed, and the Model is reserved in the Society's Repository.*

THE frequent fires which have lately happened in the different manufactories of tallow, soap, oils, varnishes, and other inflammable matters, in various parts of the kingdom, have induced the Society to publish a description of a model of a boiler presented to them by Mr. Bream, of Yarmouth, in 1786, of which no particulars had been heretofore given in the Society's volumes, and which appears well calculated to prevent the dangerous accidents which often occur from the use of boilers on the common construction.

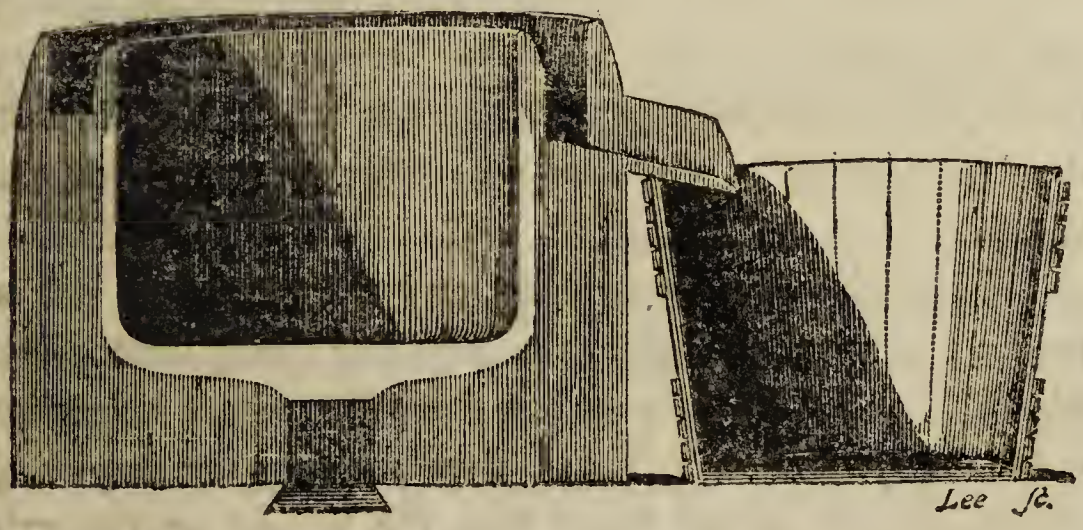
The very little additional expense attending the make of boilers upon this principle, and the great degree of safety procured by this means, may perhaps claim the attention of government, or of the insurance-offices to insist upon their use in manufactories of inflammable matters.

The first figure represents a bird's-eye view of the boiler and receiving-vessel; the boiler has a double rim containing a channel, communicating by a spout with a vessel below, placed near the side of the boiler. In case the inflammable matter should boil over the inner rim of the boiler, it is received by the channel betwixt the inner and higher outer rim of it, and conveyed immediately by the spout into the

the vessel placed underneath, without risk of loss or damage.



The second figure shows a section of the boiler and receiving-vessel; in which it will be observed, that the channel which conveys away the fluid which accidentally boils over is much deeper on the side next the receiving-vessel, in order to accelerate the descent of the boiling fluid into it. The spout should be placed at some distance from the ash-hole and fire-place, for better security.



The SILVER MEDAL *and* TWENTY-FIVE GUINEAS *were this Session voted to Mr.* GEORGE PRIOR, *jun. of Otley, in Yorkshire, for a Clock Escapement. The following Communication was received from him, an explanatory Engraving is annexed, and a complete Model is reserved in the Society's Repository.*

SIR,

SINCE I had the pleasure of seeing you, when my father and I were in London, I have invented and made the machine now sent to your address; and I will thank you to lay it before the Society of Arts, &c. the first opportunity.

This Escapement will do for a pendulum of any length, and the friction is so small that it does not require any oil, for it may be made as little as the tooth of the wheel can sufficiently touch the impelling spring, and yet be properly scaped.

It is necessary that the detent spring, the impelling spring, and the pendulum should all spring from one right line or centre, and the impelling spring to be so much stronger than the detent spring as will always be sufficient to unlock the wheel.

The machine being wound up, and the pendulum put in motion towards the left side, the impelling spring unlocks the wheel, when a tooth falls against the pallet, where it remains until the pendulum returns; then moving the impelling spring, and the wheel being free, the weight on the axis causes it to advance while it escapes one tooth off the end of the pallet or spring, and another tooth is locked against the detent spring, as before, while the pendulum returns,

and

and the impelling spring again unlocks the detent; as the impelling spring moves towards the left, the resistance it meets with by the elasticity of the detent spring in unlocking is returned to it, so that there is no more power lost than what was caused by the pressure of the wheel against the detent spring; by which means it is freed from the loss of the maintaining power, which is evident in all detached escapements I have seen, by the pendulum or crutch, &c. touching a spring or lifting a lever to regain the position for unlocking the wheel.

I am, Sir,

Your most obedient humble servant,

GEORGE PRIOR, Jun.

Otley, Yorkshire,
April 13, 1809.

To C. Taylor, M.D. Sec.

P. S. The screw in the pendulum rod is to adjust the machine when fixed up.

Description of Mr. Prior's Escapement. Plate XII. Fig. 1, 2.

Fig. 1. is a side, and fig. 2. a back view of it, which is supposed to be taken from behind the clock; *a* represents the axis of the swing wheel, or last wheel of the train of the clock; *b d* is the swing wheel fixed upon it, having 30 serrated teeth, it is turned round in the direction from *b* to *d*, by the maintaining power of the clock, (in the model this power is supplied by the descent of a small weight attached to the end of the small line, which is coiled round the barrel *f*, on the axis of the swing wheel); *g* is a spring detent,

which locks against one of the teeth of the swing wheel, and this prevents its running down, by the action of the maintaining power; *h* is another spring detent, which is called the impelling spring; when left at liberty, it unlocks the former by pushing against the end of the small arch. Fig. 2. *e* fastened to the detent *g*, and thus removing the end of the detent which obstructed the wheel's motion; *l* is the rod of the pendulum suspended by a cock screwed to the back plate of the clock, a small piece of brass projects *k*, fig. 1. at right angles from the impelling spring *h*, so as to intercept the pendulum rod in its vibration, and at this place a small screw is put through the pendulum rod *l*, the point of which moves the impelling spring back; a small pin is fixed to the frame in a line between the point of suspension of the pendulum, and in the center of the swing wheel, against which the impelling spring stops when at liberty.

Supposing the pendulum to be vibrating backwards and forwards, and the wheel locked as in the figure, the pendulum swinging from *m* to *n*, fig. 2. the impelling spring *h* follows by its elasticity, until the pendulum *l* arrives at the perpendicular; at this period the impelling spring comes to rest against the end of the arc *e*, which it pushes back, so as to release the tooth of the wheel from the detent spring *g*; the wheel now moves round a very small space before it meets the end of the impelling spring *h*, and is stopped thereby, in the mean time the pendulum continues its motion the extent of its vibration towards *n*, when it returns, and arriving at the perpendicular, it meets the impelling spring *h*, and carries it along with it, until the tooth of the wheel which rests against it, escapes from the end of it, and another tooth of the wheel comes to rest against the spring detent *g*. The succeeding vibration of the pendulum repeats the same operation.

Mr. Prior's Escapement.

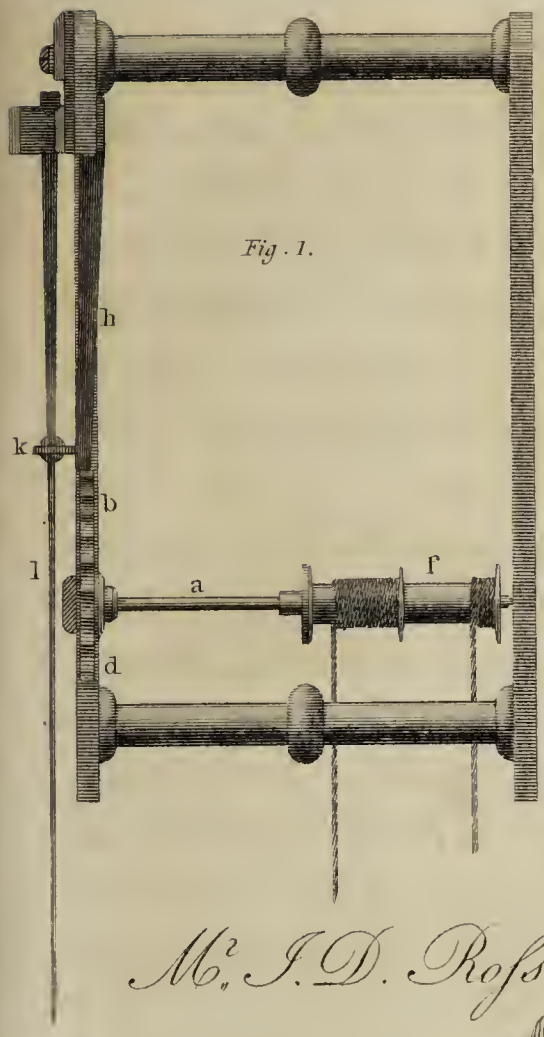


Fig. 1.

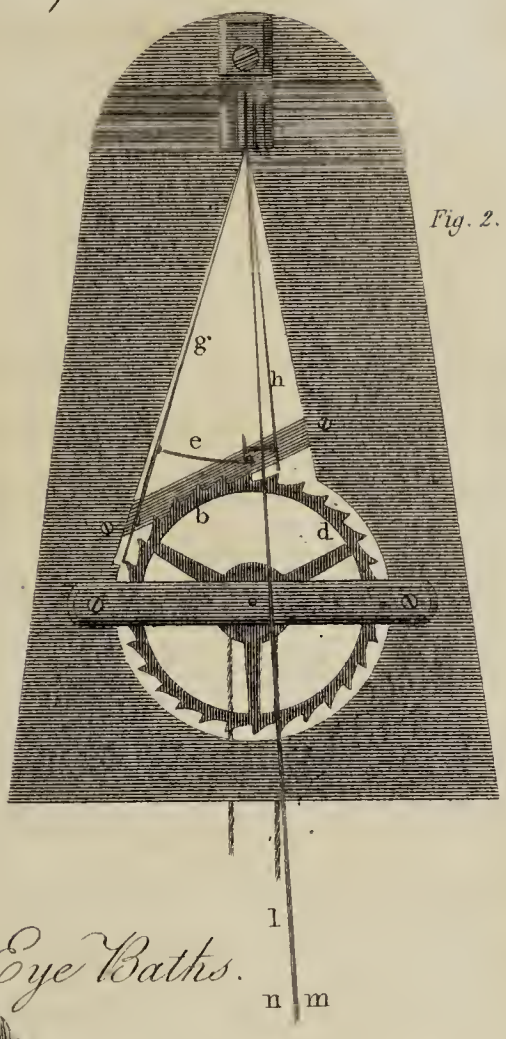


Fig. 2.

Mr. I. D. Ross's, Eye Baths.

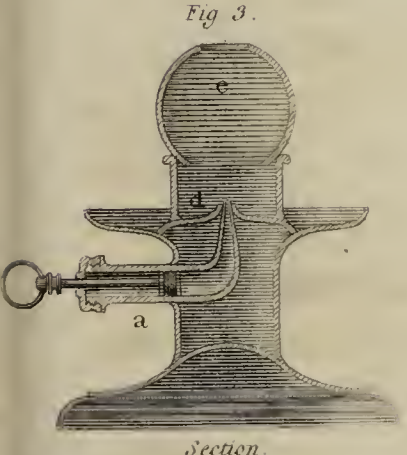


Fig 3.

Section.

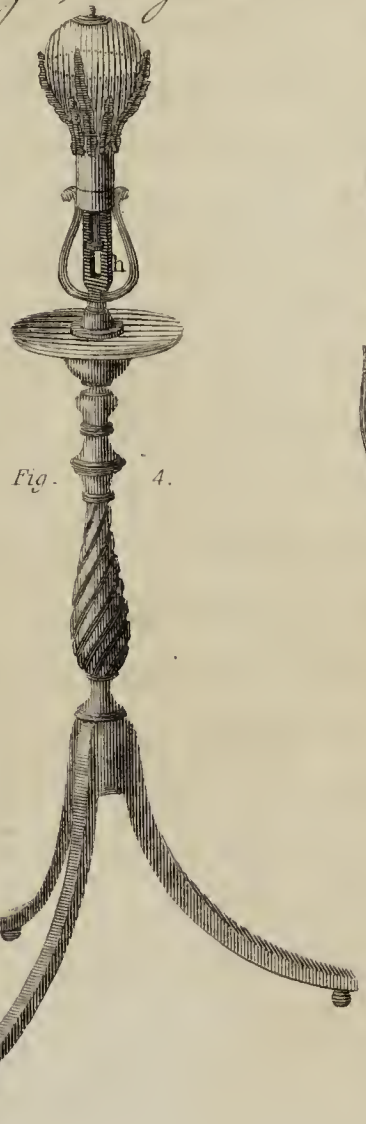


Fig. 4.

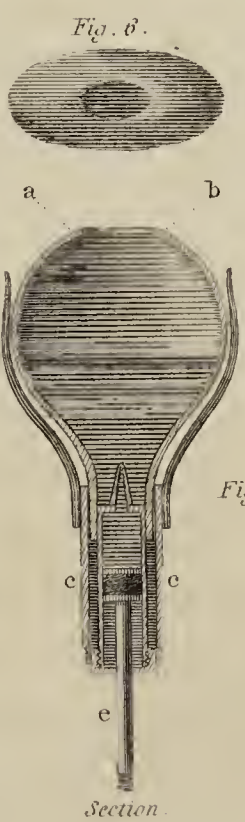


Fig. 5.

Section.

Fig. 6.

wn by T. Farey, Junr.

Engraved by S. Porter.

FIFTEEN GUINEAS *were this Session voted to Mr.* JOHN DUCKETT ROSS, *No. 55, Princes-Street, Leicester-Square, for an Eye Bath, to clear the Eye from extraneous Matters, and to assist the Sight. The following Communication was received from him, an explanatory Engraving is annexed, and one of the Machines is reserved in the Society's Repository.*

SIR,

BEING employed in the jewellery business, I have frequently suffered greatly from extraneous substances getting into my eyes, at different times, whilst I have been at work; and I have witnessed many accidents of a similar kind, which have happened to enamel-grinders, turners in metal, jewellers, lapidaries, and other artificers. These circumstances led me to attempt some means which would relieve such misfortunes, and also strengthen my own eyes, which were naturally weak. I have now succeeded in inventing an eye bath, possessing all these advantages; and which I beg leave to lay before the Society of Arts, &c. and hope it will be patronized by them.

The machine I have sent, forms an elegant ornament for a lady's or gentleman's dressing-room, and has been found very serviceable in use, of which I will furnish the Society with certificates.

I remain, Sir,

Your most humble and obedient servant,

JOHN DUCKETT ROSS.

No. 53, Greek-street, Soho,
March 6th, 1809.

TO C. TAYLOR, M.D. SEC.

SIR,

I THOUGHT it might not be improper to acquaint you, that Mr. Carpue has, according to a promise he made me, this day honoured my invention, by expressing his fullest satisfaction of it before the Medical Board; and that surgeon-general Keate, and Mr. Gillham, late chief surgeon to the Coldstream regiment, have, in consequence, favoured me with their orders; and I am further assured, that there is great hopes of my invention being generally adopted for the use of the army and navy.

I am, Sir,

Your obedient humble servant,

JOHN DUCKETT ROSS.

No. 7, Old Belton-street, Long Acre,
March 14th, 1809.

To C. TAYLOR, M.D. SEC.

Certificates were received from Mr. CHARLES SILBERRED, Optician, Aldgate.

Mr. RICHARD CARPENTER, Engraver, Aldgate, High-st.

Mr. EDWARD SEYMOUR, Engraver, &c. Greek-st. Soho.

Mr. WILLIAM WHITEFIELD, Engine-turner, Silver-st.

R. SQUIRRELL, M.D. Soho-square.

Mr. ROBERT SALMON, of Woburn.

Mr. J. C. CARPUE.

Mr. EDW. GEO. ADAMS, High-street, Mary-le-bone.

Stating, that they considered Mr. Ross's invention for the eyes

eyes calculated to produce many excellent advantages to the public, and likely to become extensively useful.

Description of Mr. Ross's Eye Bath. Plate XII. Fig. 3, 4, 5, and 6.

Fig. 4. Plate XII. is a perspective view of the eye bath, which is preserved in the Society's Repository. This apparatus is supported on a pedestal, or tripod. The bath part is represented on a larger scale in section, fig. 5, where *a b* represents a glass vessel, which has a neck at the lower end, and an aperture at its vertex, as is shown in the plan, fig. 6. to fit the eye. The neck is cemented in a brass tube *c c*, which is supported, by being screwed into an ornamental piece of brass work at the top of the pedestal. This tube encloses a common pewter syringe, the end of which is cemented into the neck of the glass vessel, as the section sufficiently explains. The handle *e* of the syringe, has a piece of brass screwed to it, which slides up and down, between two pieces of brass at *h*, in the pedestal, and a glass dish *i* is fixed below the frame, to receive any water which may be spilled by accident. When the instrument is used, the glass vessel is to be partly filled with water, (or any other liquor with which the eye is to be syringed,) so as to cover the orifice of the syringe; the patient then places his eye over the aperture in the glass vessel *a b*, and suddenly lifts up the brass slider at *h*, to which the handle of the syringe is fixed, so as to force the liquor contained in the syringe through that in the glass vessel into the eye; the liquor which covers the point of the syringe takes off the force with which the liquor would be thrown into the eye, so as

to

to render the operation not in the least painful. A more commodious, though less elegant form of the same apparatus, is shown in fig. 3. The syringe *a* is here placed horizontally, its point being turned up. It is soldered into a vessel of japanned tin, and the glass *e*, which is here globular, is laid loose on the japanned vessel *d*, which contains the liquor that surrounds the point of the syringe. This apparatus fig. 3. is intended to be placed on a table when used.

The THANKS *of the Society were this Session voted to Mr.* GILBERT GILPIN, *of Old Park Iron-Works, near Shiffnal, for the following Letter, in addition to his Communications in the former Volumes of the Society, on his Improved Crane and Flexible Chains.*

SIR,

PERCEIVING in the chains of the cranes a small degree of brightness upon those links which work vertical, and which was evidently caused by the angle, in which the former works from block to block, producing side friction in the grooves of the pulleys, I determined to try a set of the latter, with a concave rim on each side, to embrace the links which work flat, and thereby prevent those which work vertical from coming in contact with the sides of the grooves. In other respects, they are exactly similar to those mentioned in the Society's Transactions, Volume XXIII. page 273; and the following is the corresponding experiment tried with the same crane, chain, &c.

The

The crane was loaded with,	Took to hoist the loads, when reefed with the chain improved grooved pulleys,
First, 2000 lbs.	58 lbs.
Second, 1000 do.	30 do.
Third, 500 do.	16 do.
Total 3500 do.	104 do.

So that on the average of the trials, one pound raised 33,65 lbs. and, consequently, this crane works 7,68 per cent. more flexible with a chain reefed in the *improved* grooved pulleys than with the original ones; 28,87 per cent. more flexible than with an half worn, strand laid, tarred rope, of three and a half inches in circumference; and 37,51 per cent. more flexible than with the same chain promiscuously, as in the common way.

After upwards of six years practice in cranes and machines for raising coal and ore from mines, my former conjectures in regard to the safety, durability, and cheapness of chains when worked in grooves, (see the Society's Transactions, Volume XXV. pages 78, 79, and 80,) are in a great measure confirmed, for they do not even now appear to be one-third worn. Indeed, this method of making them renders chains much preferable to hempen ropes in every respect, and leaves nothing more to be wished as a substitute for that expensive article.

The war with Russia having nearly suspended the importation of hemp, round tarred ropes are advanced to fifteen pence, and patent flat ones to twenty-one pence, per pound, whilst chains continue at sixpence. Economy in the use of the former, has therefore become a matter of primary necessity, and in consequence, at those pits where we worked with one of each, the rope is now attached to the barrel, merely to

lower the men in the morning, and hoist them up at night, remaining disengaged all the rest of the day; *the chain* (being braked down each time with celerity) *raising all the coal and ore.*

All the workmen in this *manufactory* consider chains, when worked in grooves, equally safe as the best hempen ropes; but *some* of those belonging to the *mines* pretend to think otherwise; I say pretend, because though they will not *descend* the pits by a chain, yet, to come to some scene of amusement upon the surface, two or three *ascend* by it together, *riding upon the loaded basket.* It is certain, therefore, that their opposition to chains arises from perverseness, and not from any idea of danger.

The great demand for chains and tire has induced me to become a manufacturer of those articles; and I am now selling the former, made of the best Shropshire iron, at sixpence, and the latter at three pence, per lb.

I am, Sir,

Your obedient humble servant,

GILBERT GILPIN.

Statements of the Calculations in the preceding Letter.

31,25	33,65	100	107,68
26,11	33,65	100	128,87
24,47	33,65	100	137,51

For further particulars relating to this first column, see Vol. XXIII. page 274.

Old Park Iron-Works, near Shiffnal,
August 2, 1809.

To C. TAYLOR, M.D. SEC.

We

We the undersigned tried the experiments mentioned in the preceding letter, and do hereby certify the same to be a true and correct account, as witness our hands this 9th day of May, 1809.

THOMAS BLAKEMORE, Clerk, JOHN BALL, Engineer, MICHAEL TART, Smith, JOSEPH FELTON, Forge-carpenter,	In the employment of Messrs. T. W. and B. Botfield, at Old Park Iron-Works.

I have sent in a small box, by the Shrewsbury waggon, addressed to you, one of the pulleys and a piece of the chain with which the experiments alluded to were tried.

G. GILPIN.

The THANKS *of the Society were voted to Mr.* SAMUEL ROBERTS, *Chairman of a Committee appointed at Sheffield for encouraging the Sweeping of Chimneys without the use of Climbing-boys.*

The Society, anxious to relieve the sufferings of humanity, have attended with much pleasure to the Endeavours of the Inhabitants of Sheffield, and co-operate with them in their attempts to supersede the Necessity of employing Climbing-boys; they have, therefore, immediately on receiving the following Communication, ordered it to be inserted in their Volume, and an explanatory Engraving of the Machinery employed to be annexed.

The

The original Drawings are preserved in the Society's Repository.

The former Communications, made by the Society of Arts, &c. on the subject of sweeping Chimneys by Machinery, may be found in the 23d and 25th Volumes of their Transactions.

SIR,

I HAVE taken the liberty of sending herewith some papers, and a request from the Committee formed here for encouraging the use of machines in sweeping chimneys, that you will have the goodness to lay them before the Society instituted for the Encouragement of Arts, &c. It is the wish of the Committee here, that they should be published in that Society's Transactions, as appearing the most likely method of drawing the attention of the public to the subject. We think there will be a necessity of an Act of Parliament; and, without that, no great good will be done in the business.

I am, very respectfully,

Sir,

Your obedient humble servant,

SAMUEL ROBERTS.

Park Grange, Sheffield,
Oct. 12, 1809.

To WILLIAM TOOKE, Esq.
Gray's-Inn.

SIR,

SIR,

In making this statement to the Society instituted for the Encouragement of Arts, &c. respecting an object which has frequently engaged their attention, the Committee who make it are actuated by a desire of putting the Society and the public in possession of all that information which they have obtained from extensive experience, thereby enabling the Society to form a more accurate and just estimate of the degree of probability that there is of final success, than they otherwise might be able to do. As the Committee mean not to found any claim to reward, they have only been anxious to convey the information in the most convenient and ready way, without perhaps exactly observing the forms prescribed by the Society. The same considerations which have so frequently pressed themselves upon the notice of the Society, respecting boys employed by chimney-sweepers as climbers, operated on the minds of many individuals in this town, and upwards of two years ago gave rise to a general meeting, which appointed a Committee for the purpose of endeavouring to improve their situation, and of superseding the necessity of employing them at all, by substituting machines for that purpose. This Committee procured by subscription a sum, which, though not large, has hitherto served to defray those expenses necessarily incurred in the prosecution of the object for the attainment of which they were appointed. The Committee than procured one of the machines from Mr. Smart, and engaged a clever, active man to undertake the working of it (having first offered it to all the regular sweepers, who refused it). The Committee then endeavoured, by public and private application, to induce as many of the inhabitants as they could

could to encourage the use of the machine; in which endeavour they were as successful as could have been reasonably expected. As all the regular chimney-sweepers have endeavoured by every means in their power to impede the use of the machine, the Committee found it necessary to procure a boy to assist the man with the machine, and in cases where necessity required it to go up the chimney, because the regular chimney-sweepers refused to suffer their boys to complete the sweeping of those chimneys where the machine had failed. The brush procured from Mr. Smart being found rather difficult to work, and liable to be out of order, the Committee made, and caused to be made, many experiments for the purpose of improving it. Those of which they have sent drawings, Plate XIII. figs. No. 1. and 2. seems to them the most simple, the most easy to work, the most durable, and the most efficacious of any which they have tried or seen. The result of all the experience which the Committee have now had is, that though probably nine-tenths of the chimneys in this town, as they now are, might be swept with the machines, yet that not one in ten of those will voluntarily be permitted to be swept by them, however much the Committee may exert themselves, because it probably will always take up some more time in the operation, and there is some risk in the first instance that the chimney may not admit of being swept by the machine, and because the ordering of it is generally left to servants, indifferent to the object, and inimical to new experiments, which might cause them more trouble. It is very possible, by stating striking and recent cases of oppression and suffering, to arouse humanity to expressions of sorrow and commiseration, but not often to great and continued efforts to assist, especially if it require any sacrifices, however trivial. It therefore follows, that, unless the method of sweeping

chimneys

chimneys with machines can be rendered less expensive and less inconvenient than by boys, (a thing not to be expected,) the practice will never voluntarily become so extensively adopted as to diminish in any considerable degree the number of climbing-boys. The Committee are therefore decidedly of opinion, that the object which they are endeavouring to reach, can be in no other way effectually obtained than by an Act of Parliament prohibiting chimney-sweepers from taking any more climbing-apprentices, and from employing any others than apprentices as climbing-boys. The Committee are of opinion that such an Act would effectually produce the desired end, without subjecting either the public or chimney-sweepers to any very serious loss or inconvenience, because the chimney-sweepers would have an opportunity to get into the practice of using the machines, before the present apprentices were out of their servitude, and the generality of those chimneys, which now cannot be swept with the machines would be easily so altered as to render them capable of being swept with them, and all new chimneys would of course be so constructed. The Committee further feel confident, that the attention and ingenuity of able mechanics and others interested, would be so much turned to the completion of the object, that very considerable improvements in the machines, and in the manner of working them, would be very soon made. As one of the most likely methods of producing the effect, the Committee have thought it right thus candidly to state their sentiments and opinions to the Society, to whom they will be happy to give any further information in their power, which may be thought likely to conduce towards obtaining the object of which they are in pursuit. The Committee need not attempt to describe the degree of suffering, consequent deformity, great depravity, painful diseases, and frequent

loss of life, which attend the present practice to so many thousands of helpless and unoffending children, who might otherwise become happy, useful, and worthy members of the community, because the Society were fully satisfied on these points long before the Committee who now address them were called upon to assist in the endeavour to remedy them. That the Committee have not been exaggerating the capability of the machines, (imperfect as they must be admitted at present to be,) is evident from the list sent herewith of such chimneys as have been swept with them here during the first twelve months, being upwards of twelve hundred, in spite of all the prejudice, opposition, and difficulties against which they had to labour, also from the number of respectable signatures approving of and recommending, after trial, the use of the machine. For it must be recollected, that it is only amongst the more opulent inhabitants, and, consequently, in the highest and most difficult chimneys, that it has hitherto been principally used, because, amongst the lower class, the regular chimney-sweepers have been accustomed here to sweep for the soot only, a practice not yet adopted with the machine. The man employed here with the machine states, that if he had tolerable regular employment, at six pence each chimney, it would pay him very well. The Committee were very fortunate in engaging a person well qualified and active in the use of the machine, who has, under their inspection and directions, used his utmost endeavours to promote the success of the machine, both by improving and facilitating the use of it.

As it did not appear probable to the Committee that there would very soon be any great diminution made in the number of climbing-boys, they have not been inattentive to their welfare and comfort, but have endeavoured as much as was in their power to soften the rigour of their treatment,

ment, and to improve their situation. As the act for the regulation of chimney-sweepers and their apprentices was found to be so negligently drawn up, and so loosely worded, as to be utterly inadequate to enforcing proper treatment, the Committee, with the advice and co-operation of the magistrates, induced the master chimney-sweepers voluntarily to agree to certain regulations respecting the treatment and employment of their boys, which the Committee trust will be attended with considerable benefit to the poor children. The plan of having them to dine on Easter Monday, will give the Committee an opportunity of enquiry respecting the treatment which they receive, of giving them good advice, and of rewarding those who have behaved well.

I am, very respectfully,

Sir,

Your obedient servant,

SAMUEL ROBERTS,

Chairman.

Sheffield, Oct. 11, 1809.

To C. Taylor, M.D. Sec.

CHIMNEY-SWEEPERS.

We, the master chimney-sweepers, resident in Sheffield, whose names are underwritten, do agree to the following resolutions:

1. That we will not take any boy as an apprentice, under the age of eight years, nor will we bind any one to continue longer in servitude than he is sixteen years of age.

2. That we will not send out any boy to work before four o'clock in the morning in summer, nor before five in winter, in the town.

3. That we will not permit any boy to go out to climb a chimney after twelve o'clock at noon, nor will we suffer our apprentices, or boys employed by us, to seek work, or to be engaged in any way in our business out of doors, after five o'clock in the afternoon in summer, nor after four in winter.

4. That each boy shall have a good breakfast, before he leaves home in a morning, a good dinner between the hours of twelve and two o'clock at noon, and a good supper between the hours of five and seven o'clock in the evening.

5. That every two boys shall be allowed one good bed, with sufficient coverings, and they shall be allowed at least eight hours rest in each night.

6. That we will provide every boy with decent and sufficiently warm clothing, as a sweeping-dress, including a pair of good shoes, to be worn always when he is on duty, also a suitable cap, having a plate in front with his master's name and place of abode engraven on it.

7. That over and above the sweeping dress, we will provide for each boy a complete suit of good clothes, including linen, hat, shoes, and stockings, on every Easter Sunday, and that he shall appear in the same before "the Committee for bettering the Condition of Climbing-boys, &c." on the Monday following, between the hours of twelve and one o'clock, at the Cutlers' Hall, or some other convenient place, and shall be permitted to dine there, or elsewhere, on that day at the Committee's expense.

8. That

8. That we will not, on any occasion, lend out our boys to each other, or to any other persons in the trade.

9. That we do engage, on every Lord's day, to send our apprentices and boys employed by us to some Sunday-school approved by the aforesaid Committee, and also to divine service with the rest of the children who attend the same school.

Sheffield, Cutlers' Hall,
March 24, 1809.

Witness, SAMUEL ROBERTS,
T. A. WARD,
G. BENNET,
W. YOUNGE,
C. PUKSLAY,
J. MONTGOMERY,
MICHAEL MELLON, his × mark,
GEORGE RIPPON, his × mark,
WILLIAM PEARS, his × mark,
JOHN RODGERS,
JOHN BETTS.

Reference to the Engraving of the Apparatus used at Sheffield for cleansing Chimneys without the Aid of Climbing-boys. Plate XIII. Fig. 1, 2, 3, 4.

The two brushes, fig. 1. and 2. are those which at present appear to answer best the intended purpose. Fig. 1. is the easiest to work in difficult chimneys, but in those

which are tolerably straight No. 2. will be found the more convenient, as it clears itself better of the soot in ascending. Soldered on the inside of the iron hoop A, at *b* is a hollow iron tube, going through the wood balls B. The nut C screws upon the upper end of the hollow tube, through which the rope passes and fastens the whole together. The balls B are put upon the tube in separate parts, divided at *d*, for the conveniency of putting in and replacing the brush part F, which is composed of bristles, whisk, and whalebone. The whisk (which should be well selected for the purpose) is in the middle, on each side of which, above and below, is a row of whalebone, split thin, with the flat sides towards the whisk, and above and below the whalebone are bristles. Care must be taken that the whole is not too thick and strong, otherwise it will be difficult to get in and out of the pipes on the tops of the chimneys; where they are pressed together between the balls B, they should not be thicker than three-eighths of an inch. Great care must also be taken that the parts of the brushes are well fastened together, and firmly fixed between the balls B, so as not to be loosened in working. The diameter of the balls B is three inches. The distance between the two brushes F F, in drawing fig. 2. is about four inches. The wood tubes D, (which are about one inch in diameter,) through which the rope passes, should not be too long; the shortest next the brush should not exceed fifteen inches. They should gradually increase in length as they recede from the brush to the bottom, where they should not exceed thirty inches. The brush, fig. 3. is a good deal similar to a bottle-brush, the handle about four feet long, made of whalebone, wrapped with iron or brass wire, the brush part made of bristles only. It will be found to be very useful in cleaning short flues, &c. in kitchen-chimneys. Fig. 4, is a kind of tent, within which

the

The Sheffield Apparatus for Cleaning Chimneys.

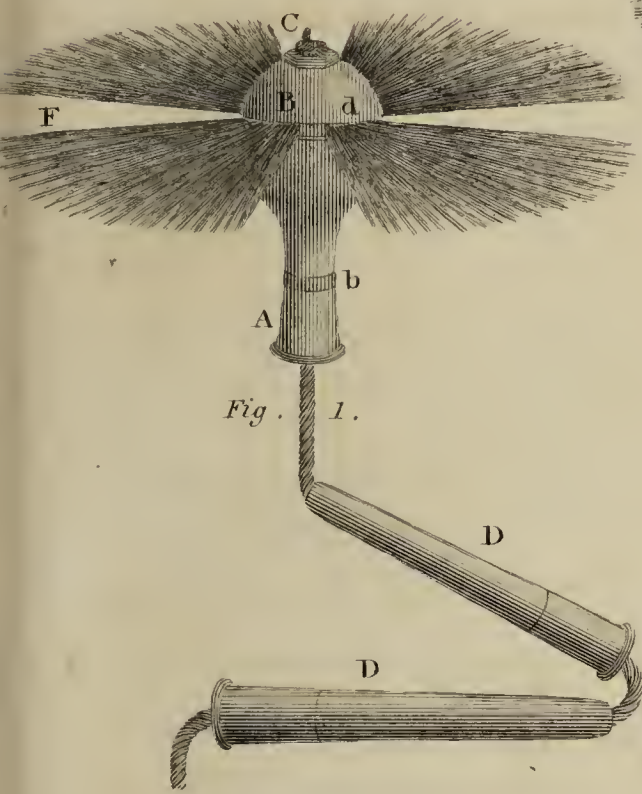


Fig. 1.

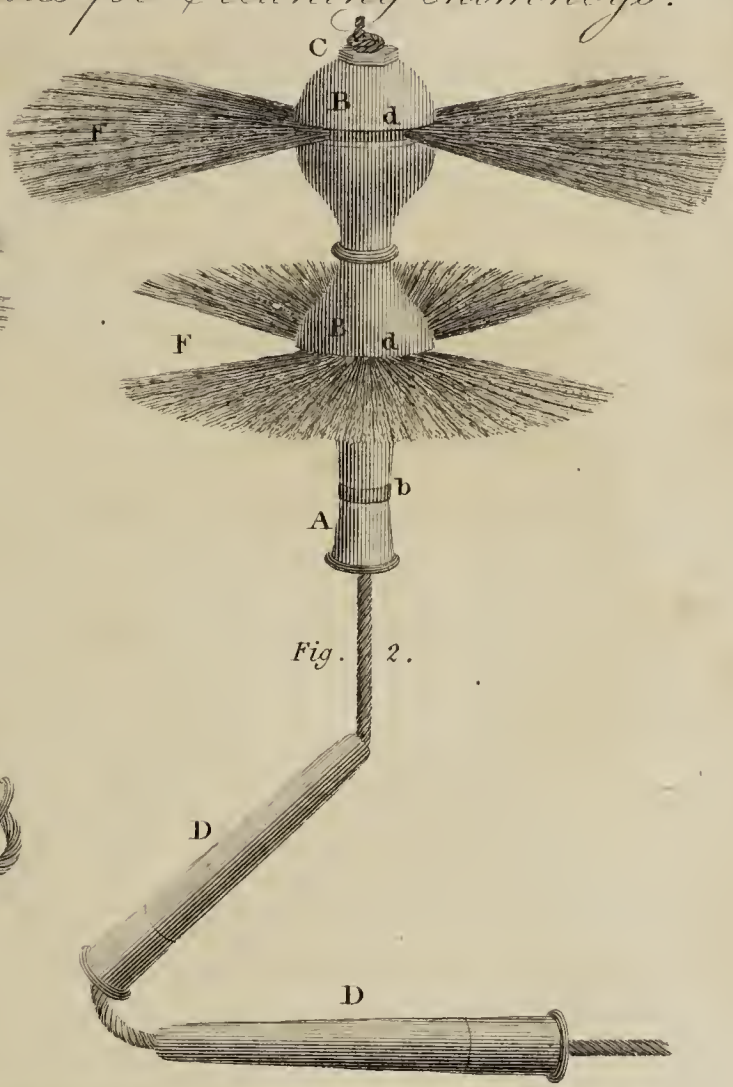


Fig. 2.

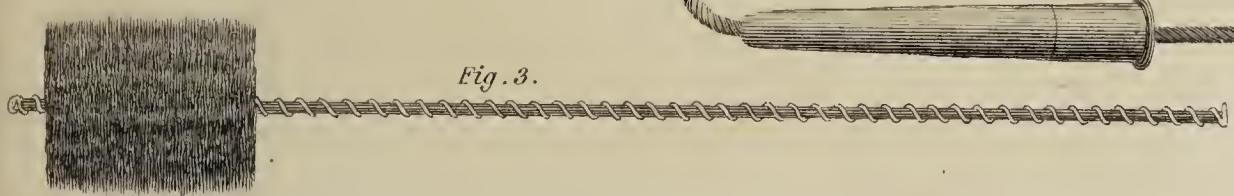


Fig. 3.

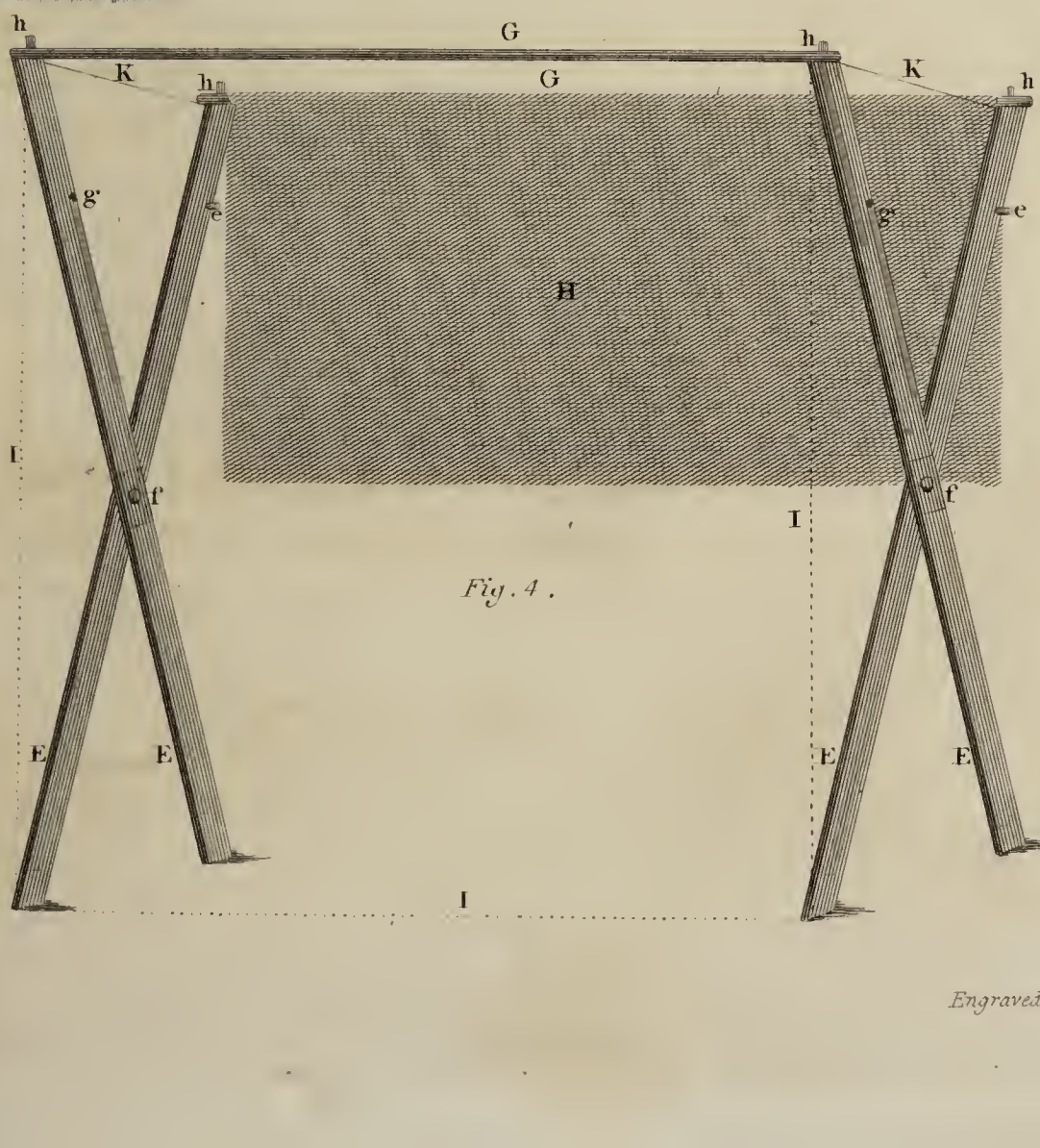


Fig. 4.

Engraved by S. Porter

the machine may be worked. It will be found useful in rooms, where it is particularly desirable, to prevent the least particle of soot from escaping. The cross bars E are of oak, about one inch and a half broad, and half an inch thick, turning upon an iron pin at *f*. G G are two small iron rods, slipping upon pegs at *h*, to each of which is suspended a linen curtain, the one next the chimney H, a short one, the other as shown by the dotted line I, a long one, reaching to and resting five or six inches upon the floor. *e e* are small pegs, which when the bars E are closed, fit into the notches *g g*, so as to stop the bars in the proper place, and prevent their being opened the wrong way. When the bars E are opened, they stretch the tapes K, which are fastened to the tops of the bars at *h*, and are about three feet six inches long, to which extent only they suffer the bars to open. When thus extended, and placed in the proper situation, a loose sheet, of the same kind of linen as the curtains, is thrown over, and hangs down over the tapes and upon the floor at each end, buttoning to the curtains at the corners, so as to form a complete tent, about five feet long, four feet wide, and five feet high, within which both the man and the boy can stand with the machine to work it.

PAPERS
IN
COLONIES AND TRADE.

The SILVER MEDAL *of the Society, set in a broad Gold Border, was this Session voted to Mr.* CHARLES FREDERICK GRECE, *of Montreal, Lower Canada, for the Culture and Preparation of Hemp in that Province.*

The following Communications were received from him, and Samples of the Hemp and Seed are reserved in the Society's Repository.

DEAR SIR,

I TAKE the liberty to inform you, that I have bought a farm near this city, and sowed this year near twenty-six acres of land with hemp-seed, which Government sent out last year, twenty-one barrels, containing upwards of two bushels each. I had not 2000 plants. In June, the ship Quebec brought some fresh; I obtained twelve barrels of that seed, and sowed it; a drought succeeded, and I lost my crop; but I am collecting seed, the growth of this country, as I find the foreign cannot be depended on. I have sown five acres this autumn,

autumn, to try what effect the winter will have on it; should it do well, it will be of great advantage to abridge the labour in the spring. Some seed, the growth of this country, did very well, that I sowed in May; but June is too late, unless it is a wet season. I have every reason to believe that the farmers will enter into this cultivation as soon as it is made known, the favours of the Government have not yet been published. I have applied all this year, and at last it is desired to be published for the information of our farmers, but we have not seed for one quarter of the applicants. I am about to erect a machine to break and swingle hemp; should I succeed, I will send a model to the Society. I presume I cannot become a candidate for your premium, the crop having failed. I cannot judge only from one bushel of Canadian seed, which I have kept an account of. I have forwarded a certificate to my brother, the President having complied with the order of Council, and I should be glad of your opinion on that head.

Permit me to subscribe myself, with grateful memory of your kindness when in England,

Your most obedient and very humble servant,

CHARLES FREDERICK GRECE.

Montreal, Lower Canada,
Nov. 3, 1806.

To C. Taylor, M. D. Sec.

SIR,

SIR,

A box of hemp was shipped at Quebec on board the ship Jane, Captain Scott, which cleared at that port on the 3d instant, for London, directed to you, the freight was paid by me. A certificate from his Excellency the Governor-general of the Colonies of North America, according to the directions of the advertisement of the Society of Arts of London, was put on board; a duplicate of the said certificate was put on board his Majesty's ship Amelia, by mistake, the gentleman at Quebec omitted informing me in time of the vessel the box would go by, which obliges me to enclose my report in the present letter, which I hope is such as is required by the Society; and should I merit the honorary reward, I shall be ever thankful for the favour so conferred on me. Should any communication be required on agricultural pursuits from this country, for the information of the Society, I shall always be happy to attend to their requests.

I am, Sir,

Your most obedient and very humble servant,

CHARLES FREDERICK GRECE.

N. B. Captain Patterson, of the Euvetta, New York Coffee-house, will take charge of your commands.

REPORT *of* CHARLES F. GRECE, *of the Isle of Montreal, Lower Canada, to the Society of Arts, &c. London, on the Cultivation and Manufacture of the Produce of one Arpent of Land with Hemp, being Part of thirty-four Arpents, cultivated by him in the Year* 1807. *The Soil a black Loam, it was an old Meadow.*

		£.	s.	d.
	*Rent of land per annum .	0	6	6
	Ploughed up in the autumn 1806 .	0	10	0
	Cross ploughed in the spring of 1807	0	7	6
	Harrowing . .	0	1	0
June 12.	Sowed broadcast, one minet of seed equal to 36 quarts Winchester measure	0	11	3
	Bush-harrowed the seed in the ground	0	0	6
Sept. 3.	The male stalks were pulled and put into a scaw, in the river St. Lawrence, to rot, when rotted spread on a meadow to dry, and when dry housed .	0	18	10
Oct. 16.	Pulled the female stalks or plants .	1	6	3
	The seed was taken from the plants by a machine, resembling a stool, with two rows of iron teeth, one inch and a half apart, intersecting each other	0	9	2
	Put to rot, when taken out and dryed it was housed . .	0	7	6
	Carried forward	£. 4	18	6

N.B. The Protestant planters pay no tithes.

* The rent of lands here, among the Canadian farmers, is not thought of.

Brought

Brought forward			£. 4	18 6
This hemp was dressed by a mill which goes by the assistance of two horses, the expense of breaking, swindling, and heckling . .			2	0 0
			£. 6	18 6
Produce of seed was seven minets and a half, at 11*s.* 3*d.* per minet	4	4	$4\frac{1}{2}$	
Fine hemp, 226 lb. at 47*s.* $9\frac{1}{4}$*d.* per cwt. . .	4	16	4	
Out shot, 45 lb. at 40*l.* per ton	0	16	0	
Tow, 20 lb. at do. do. .	0	7	$1\frac{1}{2}$	
	10	3	10	
Expenses brought down	6	18	6	
Profit . .	£. 3	5	4	

From the season for agricultural pursuits being so very short in this country, it would be difficult to plough the land twice in the spring, as such the autumn ploughing being performed, the frosts in winter leave the lands extremely mellow, and it appears once ploughing in the spring answers very well. The drill husbandry for hemp, I presume, would not answer, on account of the plants, having too much room, would become too strong, and produce little rind; I have been convinced that the finer the stalks the more rind is produced. I have sown less seed than usual to the arpent, in order to obtain taller plants. It seems two bushels and a half only produced a linen crop, which is not the object of the people of this province, they want long hemp for the purposes of navigation. I have sown all my land broadcast,

after

after two ploughings, and have had some part harvested with sickles; which is a saving of one pound five shillings per arpent; and it is an advantage in doing away the roots which make the heads of hemp when dressed very unsightly, and I have heard the manufacturers in England complain of them.

Last winter I rotted some hemp in the snow when it first fell, and succeeding snows covered it two feet: in the spring I found it very black and very rotten; as such neither snow or dew rotting will do for foreign markets. I have great hopes that in a few years many people will get into the culture of this article. I have adopted the method to purchase it in its crude state, which is a great encouragement to those who doubted their ability to manufacture.

Last year much land would have been sown, but the seed for that purpose could not be obtained, from the heavy rains which fell and carried away bridges, and broke up the roads in the United States, the way it was coming hither.

I am, Gentlemen,

With the greatest respect,

Your most obedient and humble servant,

CHARLES F. GRECE.

Quebec, 27th July, 1808.

SIR,

We are directed by Mr. Charles Frederick Grece, district of Montreal, to enclose you Governor Craig's certificate respecting hemp; also bill of lading of a box containing 26lbs.

of

of hemp, and 3lbs. of seed, shipped per the ship Jane, removed from the gentleman to your address.

We are, Sir,

Your most obedient servants,

FRS. and W. HUNTER.

To C. Taylor, M. D. Sec.

District of Montreal,
Province of Lower Canada. } I hereby certify, at the request of Charles Fredk. Grece, Esq. of Longue Point, I, the underwritten sworn surveyor, on this day, the twentieth of September, one thousand eight hundred and seven, have been on a tract of land, situate at Longue Point, in the county and district of Montreal, in the said province of Lower Canada, the property of the said Charles Grece, where I have taken the dimensions of several parcels of land on the same tract, sworn hemp-seeds, which have amounted in the whole to thirty arpents French measure.

In witness whereof I have delivered the present under my hand and seal.

Montreal, the day and year above.

(Signed)

(L. S.) LOUIS CHARLAND,
Sn. Surv.

I hereby

(L. S.)

I hereby certify, that according to the evidence which was laid before the Executive Council of this Province, in the month of September last, I am satisfied that Mr. Charles Grece did sow thirty-four arpents of land with hemp-seed, in the district of Montreal, as specified in the annexed certificate of Mr. Louis Charland.

J. N. CRAIEFF.

Castle of St. Lewis, Quebec,
7th March, 1808.

By his Excellency's command,
HARMAN WM. RYLAND, SEC.

The THANKS *of the Society were this Session voted to Dr.* ALEXANDER ANDERSON, *Superintendant of the Royal Botanic Garden at St. Vincent, for the following valuable Communication received from him.*

SIR,

I HAVE the pleasure to inform the Society, that the black Pepper plant thrives remarkably well in this garden, and has been producing fruit more than a year. Some of its produce I now transmit to you for the Society's inspection. The berries are collected before full maturity. I find it is a plant of more easy cultivation than I conjectured. After it begins to bear there is no intermission. It yields its berries in succession during the year. As soon as one crop comes to maturity the plant recommences flowering.

I have

I have collected a considerable quantity of cloves this season; but having sent last year specimens of them in different states to the Society, it would be superfluous to trouble them with repetitions.

How far custom-house duties on cloves, and the other spices usually procured from the East Indies, and now produced in this island, will admit them as articles of commerce in England, or encourage their cultivation here, I am ignorant.

I am, with great regard,

Dear Sir,

Your much obliged and very humble servant,

ALEXANDER ANDERSON.

Botanic Garden, St. Vincent,
19th June, 1809.

To C. Taylor, M.D. Sec.

The Thanks *of the Society were voted to Mr.* John Maclachlan, *of Calcutta, for the following Communication on the Products of the East Indies. Samples of the Articles are reserved in the Society's Repository.*

SIR,

I had the honour of receiving your letter of the 12th of June last, enclosing the Medal voted to me by the Society of Arts, &c. to whom, if it can be done with propriety, I

request you will do me the favour of offering my most respectful compliments.

By permission of the Board of Trade, I take the liberty of sending you a small bag of the silk, or cotton of the Simmel tree of India, with a paper with a few remarks on that curious substance.

A specimen of Salt of very extensive use in India.

Another specimen of Salt, of still more extensive use.

The first is called Lahorie, and the last Bit-Noon, or Kalla-Nimmuk. Two papers of remarks on these salts are enclosed.

For the purposes of medicine these Salts are sometimes clarified, or refined from their earthy impurities; but thinking it would be more satisfactory to have them exhibited in their natural state, they are forwarded so. As there may be still something erroneous in the natural history given me of these Salts, I shall use every endeavour to have it rectified, and if, contrary to what is set forth, they are found to be artificial, I trust I shall be able to discover the process by which they are prepared. Should you, Sir, think any of the articles, with the remarks upon them, worth the attention of the Society of Arts, &c. I beg you will be pleased to offer them with my most humble respects; but, if otherwise, they can be laid aside.

I have the honour to be,

Sir,

Your most obedient humble servant,

JOHN MACLACHLAN.

Calcutta, 17*th Jan.* 1805.

To C. Taylor, M.D. Sec.

Remarks

Remarks on the Specimens of Salt, No. 1. *and* 2.

No. 1. The Hindoos of the Upper Provinces call this Lahorie, and the Bengalees Bit-Noon. According to the best accounts I have been able to procure, this Salt is found in the hills of the Punjal, or Five Rivers, and as the name imports, those in the province of Lahorie. Whether it is precisely the Salt which Dr. Henderson, in the 14th Volume of the Philosophical Magazine, describes under the name of Bit-Noben, or Kall-Nimmuk, and which he considers as an artificial Salt, I do not know, although it agrees with his description of it as to taste, smell, and medical qualities. He observes that he was confirmed in the idea of its being artificial, from having seen a mass of it in the form of the earthen vessel in which, he thinks, it was formed; but the accompanying sample, which evidently appears to have its original and natural coat, has no marks whatever of its having been either formed in a mould, or by hand. A solution of this Salt in water emits a strong sulphureous smell, and is of very extensive use as a remedy in almost all internal disorders, whether of man or beast, in this country. Being an article that is brought from a great distance, it is sold in Calcutta at about seven rupees the maund of 82lbs. avoir. and, I think, if it was an artificial production, the natives of Bengal, who are as much alive to their own interest as any people in the world, would long ere now have been acquainted with the preparation, as well as the adulteration of it. I shall use every endeavour to ascertain, beyond the possibility of a doubt, whether this extraordinary article is natural or artificial.

No 2. This specimen is by some called Bit-Noon and Kalla-Nimmuk, and by others Loshun, and is perhaps more

generally used by the natives than No. 1. which arises probably from its being cheaper four rupees a maund.—Both specimens, although extremely different in point of texture and appearance, have the same or nearly the same properties. This has much more the appearance of an artificial salt than the other, and is, I apprehend, the kind described by Dr. Henderson, having every appearance of its being prepared by the operation of fire. The following, however, is the account given to me of it by an intelligent physician, at present in Calcutta, but who is a native of Joudpore. He says that this Salt is found in the hills of Joudpore, Oudipore, and Mewar, considerably to the southward and westward of Agra, and is universally believed to be formed by nature. During the period of the hot westerly winds, which is from about the end of March to the middle of June, the trees on those hills, among which he names the Chin-Chin, and Binnu* ignite, from the friction occasioned by their branches rubbing against one another, and produce a fire so intense as to fuse part of both the earth and rock of the hills into the very substance now under description. He thinks it very probable, that the hills contain both rock salt and sulphur; if so, it is probable the specimen, No. 2. is a compound of two alkalies joined with sulphur. This man asserts that it is formed in no other way; but this I shall ascertain more fully.

No. 2. appears to me in its porous texture not unlike the common mineral alkali, kelp, made on some of the British shores.

J. MACLACHLAN.

Calcutta, Jan. 17th, 1805.

* One of the Persian names of the Salt is Nimmuk-Bindi, the Salt of Bindi. Noon, or Noonia, is the Benguly name for salt.

P. S.

P. S. When the Salts are given internally, either to man or beast, water is given soon after to extricate the gas; they are also sometimes joined with ginger, pepper, long pepper, asafœtida, &c. They are used in disorders of the liver and spleen, of the breast, stomach, lungs, and for pains of all kinds.

The THANKS *of the Society were this Session voted to Dr.* WILLIAM ROXBURGH, *of Calcutta, for the following valuable Communications received from him.*

MY DEAR SIR,

SINCE my last, of the 9th of February, this year, I have got some further matters to communicate. In the first place, this will be accompanied by a sample of the Resin of the large Malabar tree, called by botanists *Valeria indica* *. It appears to me to resemble amber more than copal. It may perhaps be very pure copal, and in this state, like amber when rubbed on paper, as I have this moment tried it, exhibits electric powers, by attracting small bits of paper, feathers, &c. I however do not mean to point out its qualities, but rather send this sample for information, requesting you to get it examined by some well-qualified persons, and let me know the result. Large quantities may be had in this country to

* No. 1564 of my drawings of Indian Plants, sent to the Hon. Court of Directors.

send to Europe, if it is found useful, and will answer in price.

There is brought annually from Muscat in Arabia to this market considerable quantities of a similar Resin, under the Persian name *Kahroba*, which signifies *amber*; some of this I have also the pleasure to send you, and also beg to be informed of its nature and qualities. The purest pieces are susceptible of a fine polish, and are here cut into beads and ornaments, which are much wore by the natives as well as European ladies. I once saw a very beautiful string of these beads sent to England under the name of amber beads. The most beautiful amber-coloured pieces are therefore the most valuable, and are sold for about a shilling the pound by retail in the Bazar. The less pure pieces and the green-coloured are at a much lower rate. My correspondent, who resides where the tree grows in the elevated lands of Malabar, sent me chiefly green pieces, thinking, no doubt, they were the most beautiful, and would therefore be the most acceptable.

In the 9th volume of the Researches of the Asiatic Society at Calcutta is a paper on Olibanum, by Mr. Colebrooke, the president; some of this article, which he was so good as to give me to send to the Society, will accompany this letter; we both wish you would get it examined, and favour us with an account thereof as early as possible, particularly if sending it to London for sale can answer any good purpose. I have not yet got any thing which I think will answer for lignum vitæ, nor have I yet got the log of black wood (Seet. Saul. Hind) mentioned in my last letter. In the same parcel with your three specimens above-mentioned, I have put one of the Resin of *Valeria indica*, and one of Olibanum, for the Company's Museum, which I request you to send with my compliments

compliments to Mr. Wilkins, when you can furnish him with an account of their properties.

I remain, my dear Sir,

Your's very truly,

W. ROXBURGH.

Calcutta, April 18, 1808.

To C. Taylor, M.D. Sec.

My dear Sir,

Mr. Amos informs me that more of my Fever Bark is wanted, I mean the Swietenia Febrifuga, (see Coromandel Plants, Vol. I. page 18, tab. 17,) of the properties of which I gave you particulars in March, 1806. I am sorry it is not in my power to send any from hence at present, as I have none by me, and the tree grows amongst mountains many hundred miles from hence. I left some when in England with Mr. Salisbury, at the Botanic-garden, Brompton.

I wish to know the real value in England of the Caducay galls, one of the most useful dyeing drugs known in this country, and of which a particular account is given in a letter of mine, inserted in the 23d volume of the Society's Transactions. If the Mediterranean trade should be obstructed, this article would be of great service in dyeing the manufactures of Great Britain, and particularly in the Turkey red dye upon cotton, as a valuable substitute for the Aleppo galls.

I have at last got the orange dyeing drug, called wassuntaganda, for the Society, and Dr. Bancroft's experiments; it

is a powder found on the seed-vessels of my *rottleria tinctoria*. See Coromandel Plants, Vol. II. No. 168.

In a former letter to you, I mentioned that the gum kuteera was the produce of my *sterculia villosa*, which was a mistake, it is the produce of my *sterculia urens*. See Coromandel Plants, Vol. I. No. 24. I wish this may reach you in time to prevent the error from becoming public.

I have procured a log of the hard black wood *(seet. saul)*, and have shipped it in the Georgina packet, Captain Leigh, to be delivered to Mr. Wilkins, the Hon. Company's Museum-keeper, it is reckoned the largest and most durable wood of this country; but still I fear it will be too soft to be a good substitute for lignum vitæ.

The wassuntagunda I have also sent under cover to Mr. Wilkins; he will no doubt send it to you.

You will receive from me soon a corrected copy of all my former experiments on indigo, with explanatory drawings. On my departure from England, I left with you some papers on various subjects, they may contain some matters deserving notice, when you have leisure to arrange them, as I left them in a rough, unconnected state, having not had time to put them in order.

I mentioned it to you in England, that I had frequently sent the seeds of vegetables from the East Indies to London, enveloped in thick mucilage of gum-arabic, which was then suffered to dry with the seeds incorporated therewith; in this mode the vegetative power of the seeds is well preserved, it being necessary only when they are to be sown that the mixture of gum and seeds should be put into water, which will redissolve the mucilage, and leave the seeds in a state ready to be put in the earth.

In consequence of the difficulty which subsists in the carriage of plants from England to the East Indies, I have enclosed

enclosed some directions for preventing the accidents which have hitherto occasioned great losses in their conveyance.

I am, my dear Sir,

Your's very sincerely,

W. ROXBURGH.

Received without Date from Calcutta, May 18, 1809.

To C. Taylor, M. D. Sec.

Directions for taking care of growing Plants at Sea.

Particular care, if not placed in a cabin, must be taken that they are kept covered during stormy weather, or such as raises the least saline spray into the air, for the chief danger plants are liable to at sea is occasioned by the saline particles with which the air is then charged, these falling on the plants, quickly evaporate, but leave the deadly salt behind; every care must therefore be taken to guard against salt water and the spray at sea. During moderate weather, it will be proper to keep the boxes open, for plants cannot long exist without air and light, also during moderate rain, which is much better for plants than water from the cask, but too much moisture is more dangerous than drought. When the weather is dry, it will be necessary to give them a little fresh water now and then, the periods and quantity cannot be pointed out in any instructions, as the state of the weather must be the guide.

Directions where to place the chests cannot well be given, as that will in a great measure depend on the size, structure, &c. of the ship. In our Indiamen, round the capstan on the quarter-deck seems the best on many accounts, the greatest

danger

danger in such a situation is while the deck is washing in the mornings, the boxes must then be shut, and covered with a piece of canvas, or something to prevent the salt water getting in between crevices.

When plants from a cold climate get into a warm one, they shoot most luxuriantly, and often kill or choke one another; the longer shoots must therefore be frequently shortened, and as many of the leaves thinned as will give the rest air and room. Insects, particularly caterpillars, often make their appearance about the same time, they must be carefully picked off.

Baskets with roots, (such as potatoes, &c.) or succulent plants, may be hung up in any cool, airy place, such, for example, as the projecting part of the deck which covers the wheel in our Indiamen, or hung over the stern, but in that case they must be covered with a tarpaulin or painted canvas.

Seeds ought to be kept in a cool, dry place, and never put below in the gun-room, hold, or lower deck.

Roots ought to be packed in dry sand, after being moderately dried, and dispatched in any ship that sails about the close of the year.

The following Communication from Dr. B. HEYNE, *on the Soda, or Mineral Alkali, prepared in the East Indies, was presented to the Society by Dr.* WILLIAM ROXBURGH, *of Calcutta.*

Remarks on the Soda prepared from an Earth, common on the Coast of Coromandel, by Dr. B. Heyne.

SODA is a salt, known in Europe under the names of Natron Mineral Alkali, Soda, Barilla, Kelp, &c.

In

In the southern parts of Europe *, particularly in Spain and in the northern districts of Africa, it is made by the incineration of different plants, and called soda †, and barilla ‡, &c. In Scotland and Normandy, it is produced in the same way, but in small quantities and of inferior quality, and named kelp §, and soude varech.

On the island of Teneriffe, soda is found in some soil naturally, and also in Persia, China, Siberia, and many eastern countries.

All these different species are in fact but mixtures of various salts, among which soda is either the most abundant or the most valuable ingredient. Many of them, prrticularly kelp, contain but a small proportion of it, enough, however, to render them useful in different manufactures.

The most copious salt of that composition is muriate soda, commonly called sea-salt; many chemists have considered it even as the primitive substance from which soda is formed by decomposition. Whether it is so or not, I cannot decide; but it is known that ground liable to be inundated by the sea, and plants used for the preparation of barilla and kelp, growing in salt water, produce nothing but common salt, without any remarkable admixture of soda.

Near Tripoli ‖ it is found, free from sea-salt, on the surface of some grounds; the only place, to my knowledge, hitherto known in which it is had in this state of purity.

In British India, soda has been discovered in some abund-

* Vide Macquer's Chemical Dictionary, Vol. VI. p. 149, &c.

† Vide Boehmer's Technical History of Plants, (Tictmische Geschichte der Pflanzen,) Vol. I.

‡ Vide Boehmer, l. g. Vol. I.

§ Anderson's Account of the Hebrides, p. 148.

‖ Vide Wiegleb's Chemistry, p. 193, note.

ance,

ance, and has been used by the natives since time immemorial, and might be gained in such increased quantities as to supply all the demands of England.

On this peninsula it is found both inland and along the coast, but never, if I recollect right, very near the sea, or on spots washed by it. It might be rather said that it is produced on places that, for some part of the year, are swamped with fresh water; a circumstance very remarkable is, that it is obtained often without any admixture of muriates, though it is not quite free of other salts.

It admits particularly sulphuric salts in its composition, and I was in sanguine hopes of discovering borax in it, but the experiments I instituted on this account did not answer my expectations.

Its presence in a soil is indicated (if it contains sea-salt) by the mouldy and crumbling black appearance and moistness of its surface in the morning, and, where free of that salt, by the same signs, with the exception of moisture.

The washermen, and in Mysore the tank-diggers, collect it, by sweeping the places on which it is discovered. The former use it to make a ley, with which they wash and bleach, and the latter (as the natural salt-factors* of the country) extract its salt, and sell it in the Bazar, in the rainy season, to the washermen and glass-manufacturers.

This earth, commonly called Washermen's Earth, by the English, is denominated Soudoo in Telinga, and Wadamannoo in Malabar; and the salt prepared from it Soudoo-billa and Wadamannoo-billa.

* They are called tank-diggers by the English, because they are employed in the construction of all kind of mud-work. Most of them are Telingas, and a very handsome and hard-working race of people. They call themselves Uppara Wanloo, or, literally translated, salt people.

The

The places from which it is brought for sale to Bengalore are Kishnagherry and *Madoor*; at the former it is perfectly free of sea-salt, but I do not know how it is at the latter. At Matod, near Chittledroog, it is also collected in great abundance, but solely for the manufacturing of glass; and the glass gall, which is formed during the process on the mass on glass, shows that sea-salt is contained in some abundance in the soude of that place.

In smaller quantities it may be had at many places, particularly in a state in which the common salt is abounding. In this case the latter is separated (in Mysore) from it by crystallization, and considered as the most valuable part of the mixture. It is used by the poorer classes of inhabitants, who cannot afford to buy the dearer sea or bay salt, though it is said to produce eruptions on the skin; and in some places it is used by all descriptions and ranks of people.

By a slight examination I found that it effervesces with nitrous acid, and imparts a bluish-red colour to Brazil paper, indicating that it contains an alkali or earth. The colour of turmeric paper is not much changed in solutions of that salt in hot water, nor does the muriate of ammonia (sal ammoniac) mixed with it, cause a smell of volatile alkali; so that I should rather take it to contain an unsaturated muriate of lime in a small quantity, or a carbonate of lime, which it might have acquired in the vessels or beds in which it has been evaporated.

The nature and appearance of the places which produce either the one or the other deserves yet to be ascertained, as a perfect knowledge of it would throw great light on the nature of the bases of these substances.

The earth containing this salt is collected only in the driest months of the year, viz. from January to May.

The

The soudoo * from Kistnagherry, in the Barramaul, when dry is of a greyish colour, feels sandy, and has a strong saline taste in which the common salt seems to prevail. It has also a kind of smell which might be called alkaline. With mineral and acetic acids it effervesces. It stains turmeric paper brown, and Brazil paper bluish red, disengages the smell of volatile alkali, when mixed with ammoniac, and does not attract the moisture of the atmosphere. Thrown on charcoal it does not crackle. It contains in 12 ounces, according to my experiments, about $1\frac{3}{4}$ ounces of salt, and probably on an average $\frac{1}{10}$ of marketable Soudoo billa.

The natives make these billas by pouring water on the salt earth contained in conical vessels, which are open at their inverted apex, and evaporate the obtained ley in the shallow vessels or beds by the mere heat of the sun. The saline product is naturally found (mixed with many impurities) in the form of a thin cake of the size of the bed, which is broken, and is commonly about a quarter of an inch in thickness.

These pieces of the billa have all the properties that have been described of the earth, only in a stronger degree, and are therefore better adapted for the following experiments.

Alkohol renders the solution of the Billa turbid, and precipitates almost immediately acicular crystals, which, at their bases, are united and shoot but obliquely, so as to form a cone. From two drachms of it I obtained about ten grains of crystals. They effervesce with all acids, stain turmeric paper brown, have an alkaline taste, and melt easily before the blowpipe, in the beginning with some effervescence, but when redissolved muriate of barytes shews by its preci-

* Soudoo means properly earth containing salt of any kind.

pate

pate that they contain sulphuric acid. They are probably soda not quite saturated with sulphuric acid.

The presence of the sulphuric acid is farther proved by boiling the solution of the billa in water, by the slow evaporation of which, large and beautiful crystals of sulphate of soda are gained, or what was called formerly Glauber's Salt.

I need scarcely say, after what has been observed, that the muriate of Barytes produced also in the solution of the billa a copious white sediment, and that nitrate of quicksilver caused a turbidness, and afterwards a straw-yellow sediment indicating a *sulphate* of quicksilver.

Marine acid, as much as I suspected it, could not be sufficiently proved; nitrate of silver, which I employed to discover it, yields a precipitate, flocky and white in the beginning; but this I saw on reflection might also be produced by the soda and sulphuric salts; by crystallization I could not obtain a single crystal of muriate of soda.

It would be superfluous to prove by more experiments that a free alkali is contained in this product, but that it is soda (mineral alkali) and not kali (vegetable alkali) we may be convinced by attending to the different neutral salts which it constitutes with the sulphuric and other acids, and by the fact we know that carbonated kali diliquesces, and carbonated soda, as ours, keeps dry in the open air.

Lime, which I suppose to exist in considerable quantity in that aggregate of salts, I could find only in a small proportion by saccharine acid dropped into a boiled solution of it.

The carbonic acid united with it, is evinced by the effervescence that takes place on the addition of mineral acids, and by the white precipitate produced in its solution by lime-water.

In

In order to find the nearest proportionable quantity of the principal ingredients in the mixture of the Soudoo billa, I made a number of experiments, which, as they are rather defective, I will not relate circumstantially; but, by the results I am about to mention, a chemist will find that as much attention has been bestowed on them as circumstances would allow.

The Soudoo billa contains, according to many trials, about one of matter not soluble in water, as sand, straw, &c. The rest of it, namely, nine, consists of salts, and chiefly, I believe, of soda.

In order to find the probable quantity of soda in the mass, I neutralized the solution with sulphuric acid, and used particularly that contained in common alum, as its quantity is pretty nearly ascertained.

To saturate 1 ounce of Soudoo billa in rain water were required 2 drachms 40 grains of alum, which, on addition, produced a plentiful sediment of a glutinous or butyraceous substance, that, well washed and dried in the air, weighed 110 grains. It had, whilst moist, a very astringent taste, and did not seem to be soluble in alcohol, though it was apparently acted upon by that liquid when diluted with much hot water;—nitrate of silver produced a white, flocky precipitate, and dried it had an earthy taste. To judge from appearance, it might have been a muriate of alumine not perfectly saturated, or a borate of alumine; but it did not melt before the blowpipe into the glass, which the latter salt would have done, nor did it show any other signs which could entitle it to the former name.

Exposed to heat, this substance lost 55 grains, which had an earthy taste and appearance, and was probably nothing but the earth of alum.

From the strained solution I procured about 6 drachms of sulphate

sulphate of soda, (Glauber salts,) in fine crystals, which, after losing its water of crystallization, weighed about 190 grains, and consequently more than it should do, according to common acceptation.

According to the last-mentioned result, we may suppose near 116 grains* of pure soda to be in 1 ounce of Soudoo billa, which, carbonated† and crystallized, would amount to more than double that quantity, or one half in the whole mass; of which only 25 grains are to be deducted for the soda in the sulphate.

By other experiments, in which I saturated the soda with sulphuric acid, I received the same quantity, and by sulphate of magnesia I gained sulphate of soda in a much greater proportion.

From half an ounce of soda billa, dissolved in rain water, I procured near one drachm of sulphate of soda, in fine large crystals, and the rest consisted of uniform small acicular crystals, which I took for pure carbonated soda.

The proportionable quantity of soudoo billa, or Indian soda, may be estimated therefore to be $\frac{1}{8}$ of insoluble matter, as earth, &c., $\frac{5}{8}$ of soda, or carbonated mineral alkali, and $\frac{2}{8}$ of sulphate of soda (Glauber salts).

These proportions, however, are merely intended for the merchant, or as a guide to the manufacturer; for a chemist will find they are not the result of nice experiments.

It has been already observed, that the washermen of this

* Wiegleb, in his Chemistry, p. 207, says, that 68 of alkali require 52 of sulphuric acid for saturation, and that Glauber salt has half of its weight of water of crystallization. There should be contained therein 6 drachms of our salt, 115 grains of soda, and 817 of acid.

† In Wiegleb's Chemistry 6,193 is stated, that mineral alkali admits more water in its crystals than any other salt, one pound containing from 10 to 12 ounces, and page 208; that 100 parts of mineral alkali, urged with a red heat, loses 32 parts of aërial acid.

country prepare from this earth, or the salt of it, a ley, with which they wash and bleach cotton clothes, in a way superior to what can be done in other countries.

This I am sure cannot be ascribed to their skill, for what with carrying the palanqueens, and doing other menial services in the houses of the rich, they are a most stupid race of mortals. Their success, therefore, must be solely ascribed to the use of that substance.

Many learned in Europe have long ago recommended soda in preference to the more acrid potash, for the purpose of bleaching and washing, and probably nothing but the scarcity or high price of this article has prevented its general use. Should this obstacle be removed by the importation of soda, the advantage accruing from it will be soon universal.

In the making of glass it is in some parts of the country scarcely less important, as most of the Indian ladies adorn their arms and feet with the bangles made of its product, not in the most sumptuous, but, in their ideas, the most bewitching manner.

It remains now to be determined, whether *soda* would fit the European market in the state in which it is sold in the Bazar, and if it be sufficiently cheap to bear all expenses of merchandize.

Both requisites would be best ascertained by sending a sufficient large quantity to England, enough at least for some trials; to judge by mere theoretical principles and knowledge, it must answer both for the glass-houses and for the manufacturing of soap.

I imagine it will be found superior to kelp, as much so at least as the salt proved which Lorgna * obtained by elixivation of a great quantity of earth at Ritratte di Chioggia.

* He received but one pound from 150lb. of earth. Macquer's Dict. Vol. I. p. 151.

The

The small degree of hardness which the soudoo billa possesses, cannot be, in my idea, an objection to it, and may be, probably, a recommendation: but if, for the sake of conveyance, it should be required to be made harder, it could very easily be effected. Means may be also found to separate the sulphate of soda from it, if it should be found injurious.

The price of it deserves to be remarked, and the lowest at which it might be procured is to be ascertained; at present it sells in the Bazar at Bengalore, per maund (27lb. 6 ounces) at $2\frac{3}{4}$ gold fanams of 11 Madras fanams; a cwt. of course will rate about eight shillings.

At Royacotah and Kestnagherry it may be had now at $1\frac{1}{2}$ gold fanam (or 6 little fanams) per maund, which is nearly 100 per cent. cheaper than here; and I have no doubt but that, in course of time, it may be delivered at Madras, or another sea-port, at 4 fanams per maund, or for less than two shillings the cwt.

B. HEYNE.

To Dr. W. Roxburgh, Calcutta.

The following Communication of Dr. B. Heyne's *Excursion to the Diamond Mines at Mallavilly, in the East Indies, was presented to the Society by Dr.* William Roxburgh, *of Calcutta.*

Report *of an Excursion to the Diamond Mines at Mallavilly, by Dr.* B. Heyne.

Diamond mines, and the ideas they convey, should, I think, induce persons, even the most indifferent about mineralogical pursuits, to devote some part of their time, however precious,

to view those recesses in which Nature has performed one of her greatest mysteries. Many gentlemen who have resided at Ellore, or at other places in the vicinity of mines of that kind, I am sure have for that and other reasons visited them often, so that I now feel myself quite at a loss how to account for their silence on so interesting and curious a subject, and for their leaving to me the task of laying that before the world, which many of them, it may be believed, certainly were more adequate to in every respect. If it was too great a share of modesty, or diffidence, that deprived the world of their observations, I beg leave to assure them, that neither self-love, nor an improper degree of confidence, directs me in publishing my reports. It is better a thing should be half known than not at all; the former may lead to a perfect knowledge of the whole, and, on this particular subject, may animate others who are better informed, to rectify my errors or supply my deficiencies. It is with this view I have ventured to step forward.

Eight coss W. S. W. from Ellore is a village, called Mallavilly, belonging to the Nizam, and another two coss from it, where diamonds in former times, I was told, had been found. Depending solely upon this, I determined to visit these villages, flattering myself with nothing more than to find an old man in one of them, from whom some information might be collected. It was in the night of the 25th of May, 1795, when I set out from Ellore, and at day-break I found myself in that village, close to the hills, and on all sides surrounded with jungle. In expectations of discovering some singularity on the ground about me, I cast my eyes upon it the very moment my palanqueen stopped, but found that it was of a kind very common, viz. red sand and gravel. Upon enquiring after the former diamond mines, I was desired to wait a little time, if I pleased, and go along with the

miners

miners to those places which they were working. How satisfactory and pleasing this answer must have been to me, who had made a tour of almost one hundred miles, expecting to see nothing more than the remainder of former luckier times, will only be imagined by an amateur of a science who once had been agreeably surprised in the same manner. My impatience to view those remarkable places did not give me rest; I engaged, therefore, a little boy to show me the road to them, before I perceived the labourers collecting, by whom, however, I found myself soon overtaken.

Whether it was from apprehensions they came earlier than usual, or if it was the proper time to commence working, I cannot pretend to say; men, women, and children, made a group altogether of perhaps forty in number. They behaved very civilly, and entertained me, during our progress, with pointing out the fortune that might be made in a very short time by investing some thousand pagodas in working these mines. From them I heard also that it is at the Nizam's own hazard that these mines have been worked for many years past; though every body is allowed to try his fortune, provided he takes a permit from the Muzmadar and Despondiahs of the district, to whom he has to pay monthly half a rupee, and as much to the Nizam's tannadar, for every man who is employed in working the mines. Nothing is paid to the Nizam himself for the license, but he reserves a claim to all diamonds exceeding the weight of a pagoda, which is 12-13 carat; but these they meet with so seldom, that he and other Indian sovereigns do not certainly reserve the privilege, in order that the price of that article may not fall. The Nizam, I understand, enjoys that prerogative every where in the Circars where diamonds are or might be found. We conversed on such subjects till our arrival at the mine. It lies half a mile to the westward from the village, and nearer

to it than any of the older, all of which are concentrated in a kind of semicircular bason formed by hills, which encompass it from the north, west, and south, and on the opening of which to the east is situated the village of Mallavilly. The transversal section of the semicircle here, may be computed to be about one mile and a half. I did not stay long enough to ascertain what kind of stones those hills exhibited, but, according to what is commonly found in this part of the globe, they mostly consist of rocks of a coarse kind of granite, of a recent or secondary formation.

The stones which lie dispersed in the village, roads, and fields, are in a greater quantity than in other villages thereabout, and are probably dug up from the mines, and scattered about by accident. They are quite of the same kind as those found in the mines, of which I shall explain hereafter. I could not observe any particularity taking place in the products of the vegetable kingdom. The jungle thereabout consisted of shrubs that may be found in all those of a sandy soil in the northern Circars, which I will here not expatiate upon, as I may venture to do it at another time, when more acquainted with the many objects occurring in this kingdom.

The mines, if I may call them so, are large cavities, various in their breadth, but in general from 15 to 20 feet broad, and from 25 to 30 deep, all the sides being like walls cut perpendicular and smooth. The people, from the age of twelve years, and of both sexes, are working here, and are allowed three seers of Joonaloo every day for each man, besides one and a half rupee per month. The men dig the ground with long iron crows, and the women and children carry baskets upon their heads of the several strata of earth to the places allotted for each sort, which gives those works at a distance the appearance of small fortifications.

The earth of the stratum in which the diamonds are found

found they keep in a place environed with stone half way up, reckoned from the bottom of the mines to the surface of the little hillocks thrown up, from whence they carry it to another, in common the highest and lightest place, when they have enough to commence washing and scrutinizing it. At these places one or two of the Nizam's peons are constantly attending.

To lay out money in this kind of pursuit seems to be a very precarious thing; many have lost, and others would have experienced the same, if they had not the means to go on till they were reimbursed, and then they wisely stopped.

The Nizam is said not to have met with any loss of late, and that especially last year he had been very lucky, for several diamonds were found which were valued at 2000 pagodas each. He certainly deserved it, were it only for the good he did during the late famine, when he not only did not give up this business, (expensive and losing as the concern then was,) but rather increased the number of labourers. This account, however, I have from none but the labourers, who find it, very likely, advisable to extol the bounty of their sovereign rather than to speak truth.

This and many other interesting though trivial circumstances are spoken of with much more precision in common conversation than I find myself able to describe here. I shall now venture on a subject, which by many travellers has been overlooked, and in general scarcely as yet has been attended to, and which alone caused my resolution of going there, namely, to see the several stratas of earth, which cover the diamond beds, and the latter itself.

For instruction on that head, and especially to form some judgment by comparing those at Mallavilly with others, I consulted in vain the writings of learned travellers. Entertaining and curious accounts of the value of diamonds at

those places, &c. were all I could collect from them. In fact, many of them speak as if they never had never been there, and had entirely depended on the information received from the natives, who, we know in order to please, and flatter the judgment of the querists, will model their answers accordingly.

If proper notice had been taken of this, the learned would be advanced probably a little farther in the knowledge of the mode which nature uses in this operation, namely, the formation of the diamonds. My opinions on the subject, I shall perhaps venture at another time to lay before my learned judges, who will no doubt treat me kindly, even if I should be in the wrong, which I fear is likely to be the case, having to rely solely upon my own solitary observations.

Mr. Thomas Motte, who has made a journey to the diamond mines at Sum Chulpoor in the year 1766, a narative of which has been given in the Asiatic Miscellany, says little or nothing on that subject, and that little I beg leave to transcribe here literally, as extracting from it might do injustice to his otherwise very entertaining and instructing writing.

Volume the second, page 58, of the Asiatic Miscellany, he says, "The next morning, having marched three miles, we passed the side of a rock, which projected into the great river, and come to the mouth of the river Hebe, where the diamonds are found. A servant of the Rajah, who had charge of this rich spot, met us with only three attendants. A countenance naturally morose, a voice studiously rough, and sentences affectedly short, with a desire of looking formidable, joined to form one of the most disagreeable human creatures I ever saw. Raby was so much out of humour with him, as to propose to me to beat him into good manners; but this brute expressed much surprise at the curiosity

curiosity which brought me hither, and, after I had worked him into good humour by a present of two yards of scarlet broad cloth, became more communicative. He told me it was his business to search in the river Hebe, after the rains, for red earth washed down from the mountains, in which earth diamonds were always found. I asked him if it would not be better to go on the mountains and dig for that earth. He answered it had been done, until the Marhattas extorted a tribute from the country, and to do so now, would only increase that tribute. He shewed me several heaps of the red earth, some pieces the size of small pebbles, and so on, till it resembles coarse brick dust, which had been washed, and the diamonds taken out. I was desirous of going towards the source of the river, but my guide told me it was impracticable during the rainy season. Where the river Hebe discharges itself into the Maha Nudee, it is 200 yards wide. I went into it in a boat, and found a bay, near a mile in diameter, the banks of which were overshadowed by thick underwood. I with great labour got the boat forward two miles, to where the river poured from the mountains, then convinced that what my guide had told me was true, I returned not a little dissatisfied."

Of the famous traveller, Tavernier, we hear, (according to Magellan, in Cronsted's Mineralogy, Vol. I. page 123,) only that diamonds are found in a sandy earth, and the loose earth that fills the clifts of some rocks. That the mines at Coulour are in a marshy ground, and that those of Soumelpour are found in the bed of the river Goul, &c. and Mr. Bomare says that they are sometimes found stuck to rocks, and in clusters like rock crystals.

How much or little this agrees with my observation on Mallavilly, the reader will easily determine by comparing it with the following.

The

The first stratum, as above observed, is composed of a red sandy gravel, and a little clay. Its thickness in common does not exceed above one or one and a half foot. It has been formed probably by the wasting of the granit and other stones, of which the nearest hills seems to consist, which must yield, as every thing existing does, to the common destroyer time.

The heavy rains by which they are constantly destroyed is able also to remove them in this reduced state to a lower place. The sand is carried down by the same agent, and thus found, in length of time, undisturbed by the plough. The next stratum consists of a black, loamy earth, with a mixture of a little gravel, which, if I may be allowed to conjecture, was formed at a period when the natives were mere cultivators, and unacquainted with the treasures that were hid in the bowels of the ground. This I am led to believe, on account of the scarcity of large stones in this stratum. It is three feet thick, and more in some places.

The third stratum succeeding the former, and almost of the same thickness, is widely different in its composition. It is a clayish earth, loosely mixed together, and half indurated calcarious earth, both in small lumps. In point of quantity the former is the prevailing. This covers the fourth and thickest stratum of all, with which it agrees in its ingredients, composed also of clay and chalk, but in various places in different proportions. Its component parts are more intimately mixed than that of the former, and it partakes more of the chalk. The miners divide it into three different stratums, attending by doing this chiefly to the colour, which however appeared to me so insignificant in its variation, as to be unworthy of any particular notice. Had I understood their language better, I might perhaps have found even their assertions on this subject of more importance.

importance. From the middle of this stratum downwards I observed many dispersed stones of a rounded form, from half to one foot in diameter, and some of them incrusted with an ochrous matter. I cannot venture a conjecture on the mode in which this stratum, and the others in which calcarious earth is a component part, might have been produced, as it is still very dubious if this kind of earth be the primitive, or one produced by animal destruction. In this particular instance it may be depended upon that no traces, either of shells, or of any other sea products, are discoverable, which might serve to confirm the favourite idea of some of the learned.

At many other places in this part of the country calcarious earth may be found in abundance at a certain depth, and always, as I have observed, without the least sign that could give sufficient reason to trace its origin from a deluvian period. It deserves, however, on this and other accounts, to be ascertained if those strata of calcarious composition continue their course under those huge masses of granite and silicious stones which constitute the hills of these countries, and which indeed may be supposed, as they are near and almost at the foot of them. If this should be the case, it would incontrovertibly evince the seniority of the calcarious earth to that of others.

The hills of the northern circars exhibit many specimens of very fine calcarious stones, and farther to the northward, I am informed hills are found consisting entirely of a kind of marble. The Apragum and Kistnaprogum of the Gentoos and Tamuls, that likewise are collected in some places amongst the hills, regularly and irregularly crystallized, in common semitrans parent, are nothing but a gypseous spar; burnt like lime-stone, it falls to a very fine powder that does not effervesce with acids, &c. It is administered by the

natives

natives in all kinds of gonorrhœas, or in disorders to which the dissolute part of them are too frequently exposed. Another sort of stone very common on the hills, and forming often veins setting through the main rock of granite, is, if I may call it so, a micaceous spar. It is harsh and dry, with a smooth yellowish-white shining surface and fracture, breaks often in large squares with sharp angles. When beaten with a hammer it is found to consist of horizontal transparent lamellas or scales of micaceous appearance. Coloured mica, and especially black, I have found in pretty large pieces.

Want of instruments, especially an earth-borer, has prevented me scrutinizing the different strata about Samulcotah. At some places, where deep holes had been made into the ground, I found thick layers of indurated clay impregnated with ochre. Few other enquiries would be attended with more material consequence to the country and its masters than such as tend to acquire a knowledge of the different kinds of earth and strata in their possessions.

It would lead by analogous conclusions to many discoveries in mineralogy, which, if advantageous, must be highly satisfactory to every friend of man, on account of the universal benefit which may be derived from them, for unfortunately many other discoveries are in the same degree detrimental to the subjects as they are beneficial to the superiors.

For this digression, I must beg the reader's pardon. It seems at all events, for many reasons, not to belong to the subject, or it might have been retained with convenience till the next stratum had been treated of; but then I thought many other objects would offer themselves to our imagination, from which the mind ought not to be seduced by less interesting ones.

The next stratum is that in which the diamonds are found.

It

It is nearly of the same composition as the former, with the difference only of containing a greater proportion of yellow clay. The ingredients are nearly in the following proportion to each other. This, however, cannot be depended upon, as its accuracy was the result of one experiment only, which I was prevented repeating by the small quantity of the specimen I was able to carry off from the mines, the greatest part of which I wished to preserve for more experienced and learned inspection. I would have gladly seized a greater quantity, and paid for it, if the first could have been done with propriety, and the latter with the consent and without exposing the overseers to a great risk.

This stratum is from three to four feet thick, and constantly moist, owing to the water which lodges in it, which probably is accessary, or highly requisite to the formation, let us call it to the crystallization, of the precious gems; much water is collected at the bottom of the mines.

A great number of small rounded stones enter the mixture of the other ingredients of this stratum. These, the miners call the mother (matrix) of the diamonds, on account of their having observed the diamonds in general attached to them. These stones are not discoverable in any other strata, and, as above described, larger stones are not to be met with here. They are, however, what might have been expected, not of one kind or form, some being little else than an indurated lamellated ochrous clay; others a bole of the finest sort, others again a compound of silicious particles and ochre, which seem to be cemented together with clay. In one of the latter sort I found some micaceous particles that had quite the appearance of gold leaf.

The subject itself leads now to nothing more naturally than to the question, Which of these several kinds of earth is the proper matrix of the diamonds? All, except the

ochre,

ochre, and even this, though not in so great a quantity, seems to exist in all other stratas. My opinion is, that the calcarious part of the stratum, and the phosphorescent particles of the iron are the two most essential things that Nature employs for the formation of one of her hardest substances. Comus already supposed, some time ago, that this gem was chiefly composed of calcarious earth, and the phosphorescent principle. What determined him to reason thus, I cannot pretend to say, though I cannot help thinking my observation gives a great support to his opinion. The decision of this depends now entirely upon analysis of the diamond itself, which, on account of the preciousness of the gem, and my inexperience in instituting such nice experiments, I cannot venture upon in my present situation.

Bergman, in his Dissertations on the Earth of Gems, says of the diamond, "The precipitates show that there is present an earth soluble in acids, the nature of which remains to be discovered by employing a larger quantity. The deflagration, the soot, and the black pellicles, show the presence of an inflammable matter."

At other places, speaking of gems in general, he looks upon it as undeniable, that they belong, in a system of natural history, to the tribe of compound argillaceous substances, but admits of calcarious earth entering their composition.

Thus much he says in general, but does not venture a farther conjecture, on account of not having been able to subject it to a complete course of experiments.

Other chemical authors give as long and interesting accounts of the experiments insituted by several of the learned on the inflammability or deflagration of this gem, and the results; but they never enter into disquisitions about its composition, and, if they do, it is but very superficially.

There being apparently very little or no difference discoverable

verable in the component parts of the two latter stratas, another question arises, viz. What reason may be alleged for their sterility? The want of water, I conceive, and with some degree of probability. The diamond partakes, as is universally known, of the property of many other mineral substances, it being found in general in a regular form viii. and xii. angular.

Solution precedes always crystallization; and water, it should appear, can be the only fluid that here is the solvent; of any other, we find at least no traces.

Another cause may be induced, the greater age of the under stratum, which especially, if the assertion of the miners may be believed, seems to be not quite so groundless. They advance, that diamonds, though of a very inferior sort, might be found in the under part of the upper stratum.

Future, but very remote periods, therefore, must determine whether diamonds require time to come to perfection, which, if it should be the case, would even agree with the rules of crystallization, as it may be proved that too great a want of water does not admit of a perfect solution of the respective ingredients of that gem.

For the reasons stated above, I cannot but dissent from the opinion advanced by some gentlemen, who believe that this gem has been formed by the interference of fire, though even the latter, it cannot be denied, could be a menstruum adapted for producing crystallization in some substances. In the above-quoted narrative, the author is of the latter opinion, and reasons in the following manner:

"The great Boyle advances, that the generality of transparent gems have been once liquid substances, shot into the form of crystals, by the supervenience, or the exalted action, of some already-existent pretrescent liquor, or petrific spirit, which he supposes may sometimes ascend in the form of

steam.

steam. This hypothesis is supported by the doubt of Jeneherus of the diamond's hardness, by an ingenious French author, who reduces it to a phosphorus, and by some noble experimentalists, who think they have caused it to evaporate. Tavernier and others say, that the matrix in which it is formed is a cavity in a flint; but as I had samples of the strata in which it was found, both here and from Bundelchaud, and observed it was a clay which appeared burnt red, nearly to the degree bricks usually are, I think the diamond was formed not without the interference of fire, perhaps of a volcano, but that a greater degree of heat than that which was necessary to the formation of it may affect the petrescent liquor, or petrific spirit. This is a subject on which I have made some experiments, read much, and thought not a little. I may hereafter find time to collect my inferences."

The experiments on the deflagration of the diamond, should, I think, not give room to any such idea as this author and others have advanced, as it is proved, by unexceptionable authority, that this gem in open fire may be volatalized, and even when placed in balls of porcelain clay, or crucibles of that substance, according to Arcet's observation. If exposed to a fire, even not the most violent, it burns with a brilliant flame, forming a gloria about the stone, and is, in fact, consumed almost in the same manner as other combustibles.

It does not, therefore, appear very credible that the same should create the existence which causes most evidently the destruction of one and the same thing. The heat of volcanoes certainly exceeds in all its stages that of our furnaces, in which the diamond may be destroyed. The air seems not to be excluded by any impediment: how difficult, therefore, would it not be to prove their generation in that work-place, which, in the moment it produces, must certainly annihilate them again.

In

In order to oppose that hypothesis, I may further advance, that, (as far as my mineralogy goes,) in all the countries where diamonds are found, volcanoes, or even the traces of them, are not to be met with; and, on the contrary, that in other tracts of land produced apparently by those violent eruptions, no gems of this kind ever have been discovered.

What has been said hitherto is the result of ocular observations or authority, and I should be happy to continue speaking in the same strain throughout the whole; but all those subjects which have not been touched on as yet, I was prevented subjecting to that kind of inquiry which alone cannot be depended upon.

First of all, I came several days too soon for the last operation, that of separating the diamonds from the earth, and considered it rather uncertain and unadvisable to wait at that place, in order to observe their mode of proceeding in that particular business. I made, therefore, all possible inquiries concerning it, the result of which I beg leave to relate in as few words as possible. The washing-place, as already observed, is on the highest place of the mine, where light may be had from all sides. To this they bring the earth, and put it into a kind of square vat, knocked up in haste with some stones put upon each other. This place itself is scarcely ten feet square, and three feet deep, and is the most elevated part of the whole. They put some water upon the earth, and reduce the larger pieces by breaking them with stones. From thence the mass is carried to a lower square place, where it is spread somewhat thin. The labourers are then ordered to proceed in one line, and in a direction to have the sunshine on their faces, two feet asunder from each other; there they turn every stone, hold it up to their eyes, when it has a whitish clear colour, and even pretend that

with their feet they are able to distinguish the diamonds from other stones, and this particularly by their rounded form.

The diamonds are to be delivered immediately by the finder to the attending person, who has to send them to the Tannadar, who, in order to encourage the people to be attentive, seldom fails to give them small presents of a piece of cloth, worth a rupee, or a gold ring about their hands, of eight or ten pagodas value. The latter is the premium for bringing a clear stone, without spots, equal to the weight of a pagoda.

I am unable to say any thing satisfactory of the form, lustre, and value of the gems at Mallavilly. If the miners could be believed, they are found angular as well as rounded, but of how many sides and angles, whether of eight or twelve, I was unable to ascertain. It should appear, from their assertions, that the diamonds are not incrustated, as they are said to be found in other mines. Less information, and indeed none, could I collect of the rubies that occur now and then in the same mines. These being found in the same matrix with the diamonds, give no reason to think that they, with all obvious differences about them, must be near related to the diamonds, and their ingredients to be the same, with the difference only of various proportions. The analysis shows, that calcarious matter enters their composition, though in a small proportion.

In the Guntore circar I have understood there are mines of the same kind, which, being the nearest to my station, I should like very much to visit once; but the expenses which are incurred by an excursion of this kind, will not, I am afraid, admit of my doing it soon.

I almost despair of ever seeing those places on the peninsula, or the other side of the Ganges, together with the

mines

mines of other kinds, being too sensible of my limited knowledge to solicit the permission of doing it in a public capacity, and the narrowness of my circumstances do not allow me to undertake such a voyage at my own expense ; but humbly I recommend to Government (who I know receive uninterested suggestions with favour,) to send occasionally a scientific gentleman to those places, Pegu, Siam, &c. as well as Acheen, Bencoolen, &c. or to direct one who resides in or near those places to inquire particularly into their products, which we know abound in gold, silver, tin, iron, &c. with a variety of semi-metals and gems. An undertaking of still more use and consequence would be to explore the islands in the Indian seas, and especially the Andamans and Southern Nicobar Islands, as the vicinity of those countries abounds in metals, which induce a conclusion that those islands are not destitute of such treasures.

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